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# RELATIONSHIP BETWEEN MAXIMAL EXERCISE PARAMETERS AND INDIVIDUAL TIME TRIAL PERFORMANCE IN ELITE CYCLISTS WITH PHYSICAL DISABILITIES

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***ABSTRACT***

*It is widely accepted that the ventilatory threshold (VT) is an important determinant of endurance performance. This study investigated whether the physiological responses during a 20km time trial (TT) in cyclists with physical disabilities (medium to high functional ability) relate to their VT and also to determine which variable(s) best predict their performances. Nine elite cyclists (19±2yrs; 170±10cm; 62±8kg; 53±8 ml.min$^{-1}$.kg$^{-1}$) participated in the study. Subjects performed a ramped exercise protocol (20W·min$^{-1}$) to exhaustion and a self-paced, 20km TT on the Velotron cycle ergometer. Mean values for heart rate (HR) (181±8bpm) and %HR max (92±3.13%) for the 20km TT were not significantly different when compared to values at VT (HR: 180±8bpm, %HR max: 93±1.17). However, the mean power output (PO) during the TT (199±42W) was significantly lower ($p<0.05$) than the PO at the VT (250±65W). Peak power output (PPO) predicted 83% of the variance when performance was measured as 20km average watts and was the only significant variable, amongst all VT and maximal variables, included in the stepwise multiple regression model. These results suggest that the self-selected exercise intensity of cyclists with physical disabilities during a 20km TT and their VT is similar when exercise intensity is expressed as average HR and %HR max. Secondly, it has been shown for the first time that, similar to able-bodied cyclists, PPO at VT correlates best with TT performance in cyclists with disabilities.*

**Key words**: Cycling; Ventilatory threshold; Time trial; Disabilities; Peak power output; Performance.

## INTRODUCTION

The ventilator threshold (VT), defined as the first inflection point in pulmonary ventilation when expressed as a function of oxygen uptake, has been well recognised as an important determinant of performance capacity in endurance sport (Tanaka & Matsuura, 1984; Reybrouck *et al*., 1986; Haogeveen *et al*., 1999; Milani *et al.*, 2006), even more so than maximal oxygen consumption (Tanaka *et al*., 1986; Bassett & Howley, 2000). VT is commonly used for exercise training prescription, as work rates below this threshold is associated with relatively steady blood lactate levels and

thus indicates the most tolerable work rates that can be sustained for prolonged periods of time (Whipp, 1994). Similarly, the lactate threshold (LT) is also considered a valid indicator of endurance performance (Yoshida



*et al.*, 1987). However, although some studies demonstrate that the exercise intensity at LT under-represent cycling time trial (TT) intensity (Coyle *et al.*, 1991; Kenefick *et al.*, 2002), as well as cycling intensity during field performance events (Nichols *et al.*, 1997). These are not universal findings (Lorenzo *et al.*, 2011).

Regardless of the specific method used to determine LT (fixed blood lactate threshold e.g. OBLA, first rise in blood lactate above resting values, MLSS, or a rapid change in the inclination of blood lactate, etc.), some researchers found lactate concentrations much higher than those presented by LT during a 20km or 40km TT. In fact, Kenefick *et al.* (2002) reported in their study of regionally competitive cyclists and during a 20km TT, lactate values of 10mmol·$L^{-1}$; Nichols *et al.* (1997) reported lactate values of 7mmol·$L^{-1}$ in women master athletes (20km TT) and Coyle *et al.* (1991) in young male cyclists (40km TT) values of 7-8mmol·$L^{-1}$. These values were measured at 5minute intervals during the TT. These studies suggest that LT is not representative of race pace during a cycling TT even though it may be related to performance. On the other hand, Lorenzo *et al.* (2011) asserted that VT methods correlated less well than LT with TT performance. These inconsistent findings highlight the fact that many factors influence the estimation of LT and VT, among other, environmental temperature, duration of event and training status of the cyclists.

Notwithstanding the continuing debate on the relation between the various thresholds and endurance exercise performance, many researchers opt to use the VT (calculated by various ventilatory variables). There are various ways to determine VT (respiratory exchange ratio [RER], V slope method and ventilatory equivalent for oxygen), but no consensus exists on the best method (Solberg *et al.*, 2005). Amann *et al.* (2004) demonstrate that using RER=1.00 to express VT provide a significant prediction of performance in a 40km TT ($r^2$=0.57; p=0.0001). Solberg *et al.* (2005) found that RER=1.00 was the most reliable respiratory variable to determine VT because of its low inter-observer variability. Furthermore, the non- invasiveness of this method and ease of calculation are also considered important reasons to apply this method.

## PURPOSE OF THE STUDY

The objective of this study was therefore to evaluate the suitability of this method (VT expressed as RER=1), to predict TT performance in other populations, such as cyclists with disabilities. Therefore, the primary aim of this study was to identify the exercise intensity that was freely chosen by elite cyclists with disabilities during a 20km TT relative to the VT. The secondary aim was to explore which laboratory-based measure (maximum or VT-based variable) best predicts performance in a 20km TT (expressed as the average PO during the TT).

## METHODOLOGY

### Subjects

The data of 9 (8 men and 1 woman) elite cyclists with disabilities (4 with amputations, 4 with cerebral palsy and 1 with visual impairment) were analysed in this study (Table 1), while they were in the competition phase of the training year. The sample was categorised according to

functional ability (Table 2), and in accordance with the classification system of the UCI (Union Cycliste Internationale). The study sample was uniformly dispersed between medium to high functional ability (T2, C5, C4). T2 is the highest level of functional ability in the tricycle group, whilst C5 is the most functional in the cycling group. One participant was grouped under a separate column namely visually impaired (VI). All cyclists were endurance trained and familiar with TT cycling. All the subjects trained regularly on an indoor stationary cycle and thus were familiar with the current testing procedures. The study was conducted during a para-cycling training camp. Permission was obtained from Cycling South Africa to use the data. The participants signed a consent form informing them of the purpose and procedures of the testing protocols and they also consented that the data may be used for research purposes.

***TABLE 1*: DESCRIPTIVE STATISTICS OF PARTICIPANTS**

| Item | Mean (s) | Range |
|---|---|---|
| Age (years) | 19 (±2) | 16-23 |
| Body mass (kg) | 62 (±8) | 52-74 |
| Height (cm) | 170 (±10) | 155-187 |
| BMI ($kg \cdot m^{-2}$) | 18 (±2) | 17-21 |
| $VO_2$ max ($ml.min^{-1}.kg^{-1}$) | 53 (8) | 39-64 |

BMI = Body Mass Index

***TABLE 2*: CLASSIFICATION OF PARTICIPANTS ACCORDING TO FUNCTIONAL ABILITY**

| Group | T2 | C4 | C5 | VI |
|---|---|---|---|---|
| Number | 2 | 3 | 3 | 1 |

T2 = Highest classification for tricycle subgroup; C4 = 2nd Highest classification for cycling subgroup; C5 = Highest classification for cycling subgroup; VI = Visually Impaired.

All participants were tested on 2 consecutive days in the mornings. They were instructed not to exercise in the 3 days preceding the testing days. They were also told to refrain from any caffeine and alcohol intake 12 hours prior to testing and any meals 2 hours prior to testing. During the first visit subjects performed a $VO_2$ max test to determine maximum oxygen consumption, peak power output, power to weight ratio, minute ventilation and maximum heart rate. VT (determined at RER=1)

was expressed relative to all the maximal responses during the $VO_2$ max test. The following day, the participants performed a 20km TT.

**Measures and procedures**

Body mass and height were measured with the Seca stadiometer and scale (Seca, Hamburg, Germany) to the nearest 0.1cm and 0.1kg. The participants wore cycling attire during these measurements. Both exercise tests were performed on the Velotron cycle ergometer (Velotron Electronic Bicycle Ergometer, Racermate, Seattle, WA, USA). This ergometer provides

resistance via an electronic current breaking a heavy (55lb) large diameter flywheel. The pedal system of each cyclist was fitted to the ergometer and the ergometer settings were matched to their own bike set-up. The laboratory was set at an air temperature of 19 degrees for both tests. Participants were allowed to drink water after the warm-up period for both tests. Participants were encouraged to cycle to exhaustion during the $VO_2$ max test and to cover the 20km TT in the shortest possible time. In both instances, participants were encouraged and motivated during the test.

***$VO_2$ max test***

Participants completed a 15-minute warm up at a resistance of 80 watts. Gas exchange variables were continually measured (breath by breath) with the Cosmed Quark CPET (Cosmed, Rome, Italy) metabolic system. The system was calibrated with known volumes and concentrations of gasses (79% $N_2$, 16% $O_2$, 5% $CO_2$) prior to each test. Subjects were fitted with the Cosmed heart rate (HR) monitor, with HR also continuously measured. Subjects performed a ramped protocol ($20W \cdot min^{-1}$) commencing at an initial resistance of 50 watts and were instructed to maintain the cadence at 80 to 100 revolutions per minute (rpm). Participants cycled until volitional exhaustion. The test was considered maximum if all of the following criteria were met: (1) HR max was 90% or more of age predicted maximum HR;
(2) absolute $VO_2$ increase of less than $150ml \cdot min^{-1}$ with increasing work load and (3) an RER value of more than 1.15. The test was terminated when the subject stopped pedalling or when the cadence dropped below 70rpm. The ventilatory threshold was determined at an RER where the value was consistently above 1.

**Time trial test**

Participants completed a 10-minute warm up at a resistance of 80 watts. They were asked to complete the TT as fast as they could and were assisted by trained exercise physiologists to shift gears so that optimum cycling efficiency and preferred intensity was reached. Both participants and exercise physiologists were naïve regarding the results of the maximal exercise test on the previous day. They did, however, receive visual feedback via a computer screen on the speed, distance, time and workload throughout the TT. Performance variables evaluated were: time to completion; average and peak power; average and peak HR; and average and peak speed.

**Analysis of data**

Data were analysed with a commercially available statistical software program (SPSS 20.0, SPSS Chicago, IL, USA). Descriptive data are presented as mean and standard

deviations (SD). Paired t-tests were done to detect significant differences between PO, power to weight ratio (P:W) and HR at VT, and average values of these variables during the TT. Paired t-tests were also performed to detect significant differences between the average exercise intensity, expressed as %HR max during the TT and VT (expressed as %HR max) of the $VO_2$ max test. Lastly, a stepwise multiple regression analysis was performed to determine which laboratory- derived variable (VT and maximal variables in the $VO_2$ max test) predicted TT performance (expressed as 20km average PO) the best.

## RESULTS

All the participants reached well over 90% of their age predicted HR max (mean value of 98±4%) during the maximal aerobic capacity test. They also achieved RER values over 1.15 (mean value 1.2±0.03). Lastly, all participants' absolute $VO_2$ values demonstrated a plateau during the last minute of the exercise test despite an increase in workload (<150ml·min$^{-1}$). All descriptive statistics for the $VO_2$ max test (values at VT and at exhaustion) are displayed in Table 3.

***TABLE 3*: VALUES REPRESENTATIVE OF THE VT, MAX AND VT AS % OF MAXIMAL VALUE**

| Variable | Mean (s) at VT | Range | Mean (s) at exhaustion | Range |
|---|---|---|---|---|
| PO (W) | 250 (±65)<br>80% of max | 157-360 | 312 (±69) | 193-423 |
| P:W (W·kg-1) | 4 (±1)<br>80% of max | 3-5 | 5 (±1) | 4-6 |
| HR (bpm) | 180 (±8)<br>93% of max | 165-193 | 193 (±8) | 175-206 |
| $VO_2$ (ml·min-1·kg-1) | 49 (±7)<br>92% of max | 39-61 | 53 (±8) | 39-64 |
| VE (l·min-1) | 93 (±16)<br>67% of max | 63-111 | 139 (±34) | 90-205 |

PO = Power Output; P:W = Power to Weight; HR = Heart Rate;
$VO_2$ = Maximal Oxygen Consumption; VE = Minute Ventilation; VT = Ventilatory Threshold.

Participants completed the 20km TT in an average time of 36 minutes and 44 seconds. Related descriptive statistics for this test are presented in Table 4.

***TABLE 4*: DESCRIPTIVE STATISTICS FOR 20KM TT**

| Variable | Mean (s) | Range |
|---|---|---|
| Speed (km·h$^{-1}$) | 33 (±3) | 28-37 |
| Cadence (rpm) | 101 (±9) | 89-115 |
| PO (W) | 199 (±42) | 130-256 |

| | | |
|---|---|---|
| HR (bpm) | 181 (±8) | 171-191 |

PO = Power Output; HR = Heart Rate

On average, HR was 1bpm higher during the TT compared to the average HR at VT (Table 5). Also, the percentage of maximum HR during the TT was 1% less than during the $VO_2$ max test. However, these differences were not statistically significant. Conversely, PO and P:W at VT were significantly higher compared to the values measured during the TT. PO at

the VT was 51W more than the average watts during the TT ($p<0.05$). Similarly, mean values for the P:W ratio were 0.8 units lower during the TT ($p<0.01$).

***TABLE 5*: COMPARISON BETWEEN VT AND TT ASSOCIATED VARIABLES**

| **Variable** | **VT** | **TT** | **p-Value** |
|---|---|---|---|
| HR | 180 (8) | 181 (8) | 0.690 |
| %HRmax | 93 (1) | 92 (3) | 0.540 |
| PO | 250 (65) | 199 (42) | 0.030 |
| P:W | 4 (1) | 3 (1) | 0.004 |

HR = Heart Rate; %HR max = Percentage of Heart Rate maximum; PO = Power Output; P:W = Power to Weight ratio; VT =Ventilatory Threshold; TT = Time Trial

The multiple regression model revealed that only one variable contributed significantly to the variance observed in the independent variable. The PPO during the $VO_2$ max test predicted 83.2% of the variance when performance was measured as the average PO during the 20km TT ($P<0.001$).

## DISCUSSION

In this study a group of elite cyclists with physical disabilities were tested in the competition phase of their training year. The main objective of this study was to determine if VT, assessed as RER=1, can be used as a predictor of performance in cyclists with physical disabilities, similarly to able-bodied cyclists. Previous studies have found that LT based variables under- estimated training intensity during a 20- or 40km TT (Coyle *et al*., 1991; Nichols *et al*., 1997; Kenefick *et al*., 2002), while Amann *et al*. (2006) considered VT based variables (using gas exchange and ventilatory variables) superior to LT-based variables in predicting performance during 40km TTs. The use of VT associated variables and the relation to TT performance has never been explored amongst trained cyclists with physical disabilities.

The results of the current study suggest that the self-selected exercise intensities of cyclists with physical disabilities during a 20km TT and their VT are similar, when exercise is expressed as average HR or %HR max and thus provide coaches a useful tool to prescribe training intensities when using heart rate monitors. Although cyclists can also use power meters to gauge and determine training intensities, it seems that

VT is not a good estimate of exercise intensity when the exercise intensity during a TT is expressed as average power output. In the present study, participants were able to cycle at an average PO of 199±42 W, which was 20% less than PO at the VT. Amann *et al*. (2006) reported 13% lower values during the TT than the PO at VT (also using RER=1 and a ramped protocol). However, studies applying the LT as anaerobic marker (using incremental protocols) reported values on the other side of the spectrum. Kenefick *et al*. (2002) demonstrated that participants cycled at a 15% higher PO during the 20km TT than PO at LT (using 2mmol·$L^{-1}$ above baseline as LT). Bentley *et al*. (2001) also found that well trained men perform at a 20% higher PO during a 20-minute TT than at LT (measured at OBLA- onset of blood lactate accumulation).

Due to the various methods of determining LT, and the absence of exercise intensities that replicate any LT during TTs, it is understandable why Kenefick and colleagues (2002) concluded that optimal performance would most likely be accomplished if training intensities are representative of and based upon actual cycling competitions. They advised that most LT based definitions do not represent training intensity considering PO or HR during a 20km TT.

The type of testing protocol could explain a possible reason for the over-estimation of PO at VT during some VO2 max tests and the under-estimation of PO at LT during others. With a ramp protocol (current study and Amann *et al*., 2006), workload stages increased rapidly (20 and 25W·$min^{-1}$, respectively), whereas an incremental type protocol (Bentley *et al*., 2001; Kenefick *et al*., 2002) utilises larger increments (usually 30W every three minutes). Although a ramp protocol starts at a lower initial wattage, the smaller workload increments could lead to higher sub-maximal values compared to an incremental test protocol. However, similar ramped-loaded workloads and stage durations are often used in maximal tests where the VT is determined rather than the LT (Lucià *et al*., 2000; Amann *et al*., 2004; Amann *et al*., 2006; Neder & Stein, 2006). Amann *et al*. (2006) specifically showed that a ramp protocol (25W·$min^{-1}$) and its associated VT variables are superior to an incremental LT protocol (50W increase every 3 minutes) if the purpose is to predict TT performance.

The mean $VO_2$ max of the study sample was 53ml·$kg^{-1}$·$min^{-1}$, which is categorised as excellent based on gender and age (Hoeger & Hoeger, 2009). $VO_2$ values at VT were 92% of the $VO_2$ max in the current study indicating that participants were well trained (Milani *et al.,* 2006). Coyle *et al*. (1991) registered a similar percentage during an actual 40km TT where subjects cycled at an average of 88% $VO_2$ max. Coyle *et al*. (1991) further reported that the $VO_2$ measured at LT was 78% of maximum, well below the 88% of $VO_2$ max measured during the TT. Kenefick *et al*. (2002) also reported that male cyclists worked at 86% $VO_2$ max during a 20km TT while values measured at LT (2mmol above baseline) were 73% $VO_2$ max. Unfortunately the current study did not measure gas exchange during the TT, although it would have been interesting to calculate this ratio to maximum values. It does, however, seem likely that well trained cyclists register $VO_2$ values close to maximum (86-88%) during a 20km TT and well above LT $VO_2$ values (Coyle *et al*., 1991; Kenefick *et al*., 2002).

The cyclists in the present study were able to maintain a TT pace that elicited 92% of HR max, which is similar to values documented by Kenefick *et al*. (2002) (92%) and Nicholas *et al*. (1997) in women master athletes (91.6%). The able-bodied participants in the study by Kenefick *et al*. (2002) were of comparable age and experience level to the participants in the current study. Balmer *et al*. (2000) also performed a simulated laboratory 16.1-km TT and found heart rates expressed as a percentage of maximum in the 90±2% range (well trained endurance athletes). Thus, it could be argued that well trained cyclists more often than not perform at intensities close to 92% of maximum during 20km cycling TTs. These researchers suggested that traditional means of exercise prescription using age predicted maximum heart rate, underestimate training intensity, and similar to values at LT, and that actual average HR expressed as a percentage of maximum provide a better index to training intensities and race pace.

It seems then that HR at VT is more closely associated with exercise intensities during a 20km TT compared to PO at VT, considering the stabilisation of HR at more or less 92% of

maximum in well-trained cyclists. Furthermore, Lucià *et al*. (2000) demonstrated that HR fluctuates only modestly during different phases of the training season in national level cyclists. They found that although performance improved (continual changes in average power output) as the season progressed, HR values measured at VT remained largely stable (pre-season: 155±3bpm; pre-competition: 156±3bpm; competition: 159±3bpm).

A multiple regression analysis was also performed to determine which variable best predicts performance. Surprisingly only one variable, namely PPO, contributed significantly and strongly to the variance (83%; $p<0.001$) observed in the independent variable. This finding, that PPO is a powerful predictor of performance, is in agreement with the study by Balmer *et al*. (2000) who also demonstrated that performance in a 16.1-km TT could be accurately predicted from PPO. Bentley *et al*. (2001) also established that 83% of the performance variance was explained by PPO, a finding with values very similar to the current study. Similarly, Amman *et al*. (2006) demonstrated amongst many LT, VT and maximum based variables, that PPO was most strongly correlated to performance.

## CONCLUSION

To our knowledge, this is the first study to show that HR at VT and during a 20km TT is almost identical and that PPO, measured during a $VO_2$ max test is the best predictor of TT performance in well-trained cyclists with disabilities. The latter finding is consistent with previous studies in able-bodied cyclists, but has now for the first time been illustrated in cyclists with physical disabilities. These findings provide valuable practical information for these cyclists in terms of training prescription and benchmarks for race pace.

## STUDY LIMITATIONS AND FUTURE STUDIES

The participants in this study were heterogeneous in terms of disability, however,

there is only a limited number of elite cyclists with physical disabilities in South Africa. It was very fortunate that such highly trained cyclists with physical disabilities, who came from all over the country, could be tested. Although there were no significant differences in this study between the cerebral palsy and amputee cyclists for the various performance measures ($VO_2$ max, VT, PPO, P:W and PO during the TT), it should not be assumed that this would be the case in a larger sample. The small sample size may also have affected the predictive value of the multiple regression analysis.

Future studies could possibly include continuous gas exchange measurement during the TT as to compare $VO_2$ values measured at the VT or as a percentage of max with those of the TT, similar to the studies by Coyle *et al*. (1991) and Kenefick *et al*. (2002). Future studies could also explore whether the results found in this study are evident in a 40km TT, as well as TTs outside the laboratory. Lastly, it can be explored whether the findings of this study differ across training seasons to ascertain the dynamics of PO and HR at VT and also during the TT.

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# A HISTORICAL-POLITICAL PERSPECTIVE ON PHYSICAL EDUCATION IN SOUTH AFRICA DURING THE PERIOD 1990-1999

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***ABSTRACT***

*This study traced the historical path of Physical Education (PE) in South Africa from being a stand-alone school subject to its incorporation into the learning area, Life Orientation (LO). LO is an amalgamation of non-examinable subjects. The critical stance taken towards this amalgamation may also be regarded as a critique of Outcomes-based Education (OBE). The infusion of PE into LO came about as a result of teacher rationalisation and at the expense of pedagogical concerns. PE was integrated into LO without critical opposition. The introduction of OBE and the integration of PE hinged largely on political symbolism, rather than reflecting true change in the educational system, resulting in policy becoming separated from practice. The post-apartheid government did not consider PE a serious concern, due to the development of a spirit of South African national sport pride mainly promoted along the lines of mega events and through the country's re-admittance to participation in the international sporting arena. Consequently, PE with its emphasis on mass-participation activity was insignificant compared to this emerging international trend. Sources that take a judgemental stand towards LO and OBE influenced the perspective taken in this study. Research for this study used critical theory as a means of expressing dissent.*

**Key words:** Physical education; Life orientation; Outcomes-based education; Politics; South Africa.

## INTRODUCTION

A substantial volume of academic criticism exists on the lack of acceptable standards for Physical Education (PE) in post-apartheid South Africa (Van Deventer, 1997, 1998/99, 2000a, 2000b, 2002a, 2002b, 2004, 2005, 2007, 2008a, 2008b, 2008c, 2009; Van Deventer &
Pedersen, 2001; Africa & Van Deventer, 2005; Africa *et al*., 2008a, 2008b; Van Deventer & Van Niekerk, 2009a, 2009b; Rajput & Van Deventer, 2010). The major thrust of the said works is a critique of South African PE practices, without any political or historical analysis. The current article takes a historic-critical direction that focuses on how political issues have impacted on the South African school curriculum.

During the last decade of the 20th century, there was a "virtual absence of PE issues in serious, detailed, informed and open discussion at national level in Great Britain and Northern Ireland" (Alderson & Crutchley, 1990:38). Internationally, academics usually identified problems with subject content at a curriculum level, ignoring any political and economic factors that were involved (Siedentop, 1990; Beighle & Pangrazi, 2011). The situation was similar in South Africa, which led to confusion among policy developers, which

in turn filtered down to policy implementers. PE became part of the South African education experiment that involved the implementation of outcomes-based education (OBE) and that placed PE first within the Arts and Movement learning area and later within the Life Orientation (LO) learning area (see Appendix). LO was and has remained a combination of PE with other subjects. The result has been a diverse curriculum that such leading academics as Daxita Rajput and Karel J. van Deventer have criticised extensively.

The criticism has focused on the unfulfilled expectations regarding subject provision, the deplorable conditions in schools, the unacceptably long hours taken up by administrative duties, the low subject status, the difficulty in subject specialising, and the problems at higher education teacher training institutions, where academia have objected to the integration of PE, School Guidance, Religious Education and Youth Preparedness (Rajput & Van Deventer, 2010). The pervasive view in the South African education landscape has been that: "The practice of offering PE and life skills as separate subjects on the timetable is unsound and requires urgent attention, because this further fragments the learning area and polarises educators‟ and learners‟ understandings of LO" (Rooth, 2005:283,284). Another supporter of the integration of PE with other subjects into LO argues that "specialist teachers with specialist knowledge" must be trained to provide instruction in this learning area (Christiaans, 2006:186).

In contrast, academics have raised concerns about OBE-associated structures being too complex and inaccessible for most teachers to implement the policies that are in place meaningfully through their daily classroom practices (Jansen, 1999b:417). The prevailing situation is indicative of what the educationist Graeme Bloch calls "a crisis… that is hurtling at speed towards a real abyss" (Bloch, 2009:69). On a more emotive level, *The Educational Journal* (*EJ*), which is the official organ of the Teachers‟ League of South Africa, has called OBE a recipe for disaster (*EJ*, 1997a).

The criticism has been a departure from the hopeful and optimistic view that some academics held at the time of the change in curriculum, namely that:

> "… the transitional phase between the two political orders is a thrust away from Apartheid … symbolising freedom, growth, new experiences and the realisation of dreams. Opportunities are being created … for South Africans to explore their true potential and … they will play a vital role in redressing the imbalances of the past. One such sphere is … Physical Education" (Kloppers, 1996:79).

The current research considers whether opportunities for redressing the imbalances of the past were created in PE as part of LO, by providing a historical-political analysis of the subject during the 1990s.

## LITERATURE OVERVIEW

Despite the formal post-apartheid literature on South African PE history being scant, a considerable corpus of academic literature exists on pre-1994 events. Said writings are, however, tainted by concerns pertaining to „race" (Potgieter, 1972; Agjee, 1981; Boshoff, 1981; Kelder, 1984; Paterson, 1984; De Klerk, 1986; Skein, 1986; Vermaas, 1989; Cleophas, 1990, 1991, 2009; Kloppers, 1996). Historical background on PE in schools under the former Department of Education and Training (DET), being the bureaucratic agency for people who

were previously classified African, is scarce but does provide some background to the situation that prevailed at the time. One such example is the 1987 unpublished report of a postgraduate candidate of Stellenbosch University, Margret Weixlederer. The report covers her research into PE, while the subject was under the control of the DET. Weixlederer concludes her report with this finding: "… teacher training (of Africans) is not concerned enough with the planning of PE according to a syllabus and that the (official) syllabus does not take the situation of the black education system into consideration" (Weixlederer, 1987:88). The existence of a PE specialist course for African students at the Healdtown Training School in the Eastern Cape and the reasons for its closure remains an under- researched area (Healdtown Institution, c.1955; Postma, 1977).

The system of Christian National Education (CNE) and Fundamental Pedagogics (FP) provided the underlying philosophy for the teaching of PE in South Africa (Kloppers, 1996). Supporters of the CNE philosophy usually presented it as an innocent and useful tool for transmitting the concept of universal health to all through PE. However, CNE also formed the ideological basis of apartheid schooling (1948-1994), particularly regarding PE with the main characteristics being discriminatory practices that emphasised the unique aspects that make a nation great. This kind of argument was used to justify the CNE view that, "there is a *nasionale lewens- en wêreldbeskouing* [national life and world view] unique to Afrikaners" (Greyling, 1941:22,37,39). Although most schools in South Africa did not take CNE seriously, PE practitioners could not ignore the phenomenon, seeing that the apartheid education authorities used it to "counter the humanistic ideal of self-glorification" (Du Plessis, 1974:131,274). One PE academic who supported the CNE philosophy, Izak van der Merwe, believed that it ensured the future of „white South Africa" and

warned of the dangers of poor nourishment, the negative ergonomic effects of the school environment, and the general health deterioration of the Afrikaner nation in particular. He proposed the following within a CNE context:

> "… a PE system that is part of a certain race or nation where not only physical traits are unique but has a "volksiel" [soul of the nation] that has to be studied in terms of traditions, values and habits of the nation … All the beautiful Voortrekker games must be restored in honour and deserve a place in the school curriculum" (Van der Merwe, 1960:45,46).

During the 1980s in the wake of the implementation of a tricameral parliamentary system, CNE adherents tried to rid their exclusivity and infuse it into other „race groups". Physical Education was no exception. In 1986, Jan Nel submitted a doctoral dissertation, *Die rol van Liggaamlike Opvoeding as skoolvak in die vestiging van 'n Christelike lewens- en wêreldbeskouing* (The role of Physical Education in the establishment of a Christian life and world view). A comparison between a few selected extracts from Nel"s dissertation regarding previous work that had been conducted on CNE shows the similarity of language involved:

> "Education is more than knowledge and a muffling up from outside … loosen him from the national culture and home education, he becomes a valueless co- worker of that what can never become his own …" (Greyling, 1941:36).

> "It is undesirable to eliminate the national element from education, the learner makes contact with the national element from childhood … if the Christian

> element is absent from this there can be no talk of true education" (Du Plessis, 1974:28,29).

> "The education task of the Physical Educationists lays outside the movement and physical existence of the child … the subject must be a bastion for the preservation and safety of the Christian community, we plea for homes and schools where everything is soaked with Christendom and the PE teacher plays an important part" (Nel, 1986:242,243, 246).

Kloppers warned that the discriminatory ideas of CNE might continue during the post- election (post-1994) period, albeit in a different form (Kloppers, 1996). He did not specify how long he envisaged „the post-election period" would last. A limitation of Kloppers" work from a historical perspective was the lack of detail regarding the transition of PE from the apartheid era to post-apartheid. Also, the general hype about new prospects and possibilities for PE influenced his findings (Kloppers, 2011). Nevertheless, „[t]o move with a different view" was an attempt at providing contemporary historians with ammunition for critical analysis.

The history of PE in South Africa is generally not analysed within a critique of institutional linkages. Agjee (1981), for example, suggests that the Department of Indian Affairs had a "profound concern for the qualitative and quantitative improvement of the Indian education system … and provided considerable

development, expansion, consolidation and stabilisation
… for PE in particular" (Agjee, 1981:49,50). Agjee does not refer to the South African Indian Council Act of 1968, which created an advisory, wholly nominated body to deal with Indian- related affairs in three provinces (keeping in mind that Indians were not allowed to settle in the Orange Free State) (Giliomee & Mbenga, 2007). The pre-1994 South African PE landscape denied most children purposeful participation opportunities (Kloppers, 1996).

To date, only one formal historical research study has challenged the official version of PE in South Africa during the apartheid era (Cleophas, 2009). Instead, the few formal works on the subject during that era tend to emphasise the "harmonious development of all the facets of a child‟s well-being" (Lion-Cachet, 1997:v). Such notions ignore the political power struggles that were at play in PE policymaking, and see the subject‟s main contribution to education as being in "developing attitudes, knowledge and skills related to health, fitness and recreation" (Lion-Cachet, 1997:10). Lion-Cachet admits that her research "seeks scientifically substantiated answers … on the importance of the … momentous developments in South African sport and [the] purpose of PE" (Lion-Cachet, 1997:6). During the post-apartheid period, most South African schools neglected the subject in the curriculum (Mchunu, 2008). None of the works mentioned above provides a comprehensive critical-historical account of the policy collapse of PE into LO in South Africa.

## RESEARCH DESIGN

### Statement of the problem

Since the Government of National Unity (GNU) took office in 1994, there has been a general hesitancy regarding critical discourse concerning the origin of education policies. The current research paper, therefore, attempts to answer the question: *What educational, historical and*

*political factors were in play that resulted, directly or indirectly, in the integration of PE into the learning area, LO, in the immediate post-apartheid period era* (*1995-1999*)?

### Methodology

The research undertaken relies on contemporary South African literature reviews (in the form of books and academic journal articles), that deal with education and PE. Unstructured interviews were used to gather information from prominent role players in the South African PE landscape during the period under review. The contemporary historian undeniably has a particular angle of vision, which is reason enough to make certain statements with reasonable certainty in the absence of proof in the strict juridical sense (Alexander, 2002). The educational philosopher, Wally Morrow, who influenced the current research, suggests using sources that take a judgemental stand (Morrow, 1989). Within such a context, research for the present study uses critical theory as a "means to express dissent" (Haralambos & Heald, 1980:227). The current paper also argues for a reflective distancing from the daily grind of policymaking (Jansen, 2001). No attempt is made to offer solutions to the research problem, but

rather every effort is used to make critical and coherent statements regarding the practice of PE in South African schools for the period under review. Understandably, the study relies heavily on sources that take a definitive stand against OBE.

## PE IN SOUTH AFRICA WITHIN A BROADER EDUCATION SYSTEM: 1990-1999

Two key political events marked the last decade of the 20th century: the unbanning of political organisations in February 1990, and the establishment of a new regime in April 1994. Competing social movements and political actors who wanted to stake out their curriculum policy positions in the looming, and seemingly inevitable, post-apartheid capitalist state characterised the period in question (Jansen, 1999a).

It was the military visibility in the PE programme that remained a focal point around which the new education authorities rallied. A former senior Cape Education Department (CED) PE inspector mentioned how, when he applied for the new post of Senior Curriculum Advisor in the Western Cape Education Department (WCED), he was peppered with questions relating to his South African Defence Force (SADF) involvement (Nel, 1996). At the same time, General Geldenhuys (former head of the SADF) succeeded in convincing military generals to reconcile themselves to the transition process, while he "kept a firm hand on enemies of the SADF" (Williams, 2008:130). Although the military landscape remained fertile ground for PE research during the early 1990s (Du Plessis, 1990), the apartheid-era administration officials who were included in the new administration were eager to rid the government of its historic military element. In 1995, Geldenhuys was arrested on charges of apartheid crimes committed in 1985; however, he was found not guilty (Hamann, 2001).

Post-apartheid South Africa inherited a PE landscape that produced doctoral dissertations confirming physical performance „race differences" (Putter, 1964). The „new South Africa" was born with expectations of ridding itself of such findings, with official documents at the time reflecting this optimism.

PE was integrated into LO during a period of consensual politics and alternative policy formulations. According to Jansen (1999b), key political role players devised education policies that were not in congruence with the realities of classroom life. The genesis of PE as part of LO is found in the work of the National Education and Training Forum (NETF). The first facilitating meeting for the NETF, which was held on 21 May 1993, was officially launched on 7 August of the same year (Chisholm & Kgobe, 2003). The events took place amidst a power struggle between two teacher unions, namely the Cape Teachers" Professional Association (CTPA) and the South African Democratic Teachers" Union (SADTU), both of who were sympathetic to the African National Congress (ANC) (*Burger*, 1993e; 1993f).

The NETF, under the guidance of both the government and the ANC-orientated National Education Coordinating Committee (NECC) (Hendricks, 2010), had a membership of 26 stakeholders in education, as well as in business, government, tertiary institutions, and teacher and student organisations (Kloppers, 1996; Hendricks, 2010). One of the earliest
„successes" of the NETF was its role in making a deal, concerning the early retirement of 2931 teachers between the House of Representatives (HOR), (formerly

known as the Department of Coloured Affairs), and SADTU (Motala & Tikly, 2003). The HOR and the Department of Education and Culture intended phasing out 3200 teaching posts in 1993. Part of the deal was the brokering of an agreement (in which the NETF played a leading role) whereby the teachers whose posts were to be phased out could remain in service until December instead of 31 July of the year in question. However, only six teachers agreed to remain on with the Department for the extra six months (*Cape Argus*, 1993a:5). After a succession of meetings was held on the future content of the PE syllabus, the NETF recommended that schools should use the existing syllabi in the interim, and that the provinces should develop their own syllabi (Hendricks, 2004). Two prominent South African universities, namely those of Stellenbosch and the Western Cape, were not invited to submit input on the development of the PE syllabi (Kloppers, 2011; Van Deventer, 2011).

Contrary to their active participation in the earlier policy development, academics fell silent in the new official South African education landscape (Fataar, 1999). Yet, the supporters of LO persisted in their claim that PE "representatives from all the relevant education-based bodies were included on the PE sub-committee of the NETF" (Hendricks, 2004; Prince, 2011). In addition, most provinces lacked qualified specialists who could serve on research committees to develop their own syllabi (Prince, 2011). Consequently, a number of innovations emerged in the deliberations of interim provincial committees dealing with PE. One innovation was a movement towards co-educational PE (Hendricks, 2004), which reflected the title of a master‟s thesis that was written by a SADTU official, Wayne Alexander, who also served on the NETF PE committee (Alexander, 1998). The thrust of Alexander‟s argument was that co-educational education was part of the "processes of change [that involve] … letting go of past traditions and absorbing new ideas into the framework" (Alexander, 1998:112).

## REVIEWING EDUCATION IN SOUTH AFRICA AND PE EXPERIMENT WITHIN AMBIT OF OBE

The *Education Journal (EJ)* argues that the proposed PE policies that emerged in the immediate post-apartheid era were "quick fixes and fancy footwork that bedevilled a sane and

creative approach to policy and education practice" (*EJ*, 1995a:1). Some individuals who were actively involved in policy transformation processes during the period 1994-1999 stated afterwards that the "debates at the time were utopian" (Young, 2001). Others admit that "there was a quick rush into things … anything new was welcome, but were disappointed and concerned that PE became part of LO" (Alexander, 2011).

The proposed remedy for South African education – and, by implication, for PE – was OBE. According to the *EJ*, such an approach surfaced in 1993, with such terms as „Competency- based Education‟ (CBE), „OBE‟ and „continuous assessment‟ being used commonly. The OBE experiment surfaced for the first time with the appointment of the Committee on Teacher Education Policy (COTEP) in 1993 (*EJ*, 1997b). Almost simultaneously, a new policy emerged regarding the rationalisation of teacher training, The Paarl Teachers‟ College merged with the Wellington

Teachers‟ College in 1990, both having offered PE specialist training but having dropped the subject due to the rationalisation of teachers. In 1993, the Cape Town College of Education merged with the Sally Davis Training College, the former dropping the PE specialist teacher training that had been started in 1921 (*Burger*, 1993a; Cleophas, 2009).

One NETF member, Alan Tonkin from Barlow Rand (who later became the CEO of Global Values Network), justified rationalisation in terms of the (over) supply of, and the (under) demand for, teachers (*Cape Argus*, 1993b). Tonkin argued that if business "was to reach its fullest potential, it would need to create a new paradigm that moved beyond simplistic machine/industrial models to those that embraced the complex interdependencies of multiple constituencies" (Tonkin, 2008), which included the labour movement. The CBE idea was popularised in the labour movement, in particular within the ambit of the ANC-aligned Congress of South African Trade Unions (COSATU). Little integration of educational ideas into the CBE took place, the focus being on the labour movements‟ expanding relationship with business (Jansen, 1999a). The demands of business, and then of labour, largely directed the new South African education system and, by implication, PE policy.

In 1995, the new National Department of Education (NDoE) invited the HOR to be part of the discussions advocating a new positioning of PE within the school curriculum (Prince, 2011). The representatives of the different provincial departments, the DET and churches, as well as psychologists, were present. Brenda Prince, a PE subject advisor, represented the HOR, whereas the DET teachers "had no PE repertoire and no subject knowledge" (Prince, 2011). Writing teams were established to deal with the new learning areas, and Prince recalls that she was the only PE specialist on the LO writing team. The Congress of South African Students (COSAS), which was an ANC-sympathetic organisation, voiced accusations that the subject was elitist and a luxury. Prince asserts that she "was forced" to use the term
„movement‟ instead of PE (Alexander, 2011; Prince, 2011).

## UNHEEDED CRITIQUE ON THE OBE EXPERIMENT

Without warning, the NDoE released a document outlining the proposals for OBE. A former National Minister of Education, Professor Sibusiso Bengu, officially launched the system of OBE on 24 March 1997 in Cape Town, as Curriculum 2005 (C2005), amidst much dissatisfaction from government opposition forces (Jansen, 1999a). Locally, the WCED

undertook a road show to advertise the new LO programme (Prince, 2011). Only one teachers‟ union, SADTU, publicly defended OBE. The parliamentary opposition parties were excluded from discussions on the launch of C2005, and they criticised OBE because it had not been discussed at portfolio committee level. They concluded that it was an ANC affair that lacked transparency (*Cape Argus*, 1997). Official statements, such as that learning programmes and material development were not urgent, accompanied the implementation of C2005 (*Burger*, 1997).

Jansen (1999b) claims that the OBE system offered an economic panacea to benefit

those who had been alienated from education and training under apartheid, in the name of a complex curriculum reform policy. Such a connection has political goals without being founded on the accumulated research on curriculum change (Jansen, 1999b). The principles of OBE rested on achieving equity, redress, access, non-discrimination, relevance and quality education (*EJ*, 1997b). None of these features was evident in the practice of PE during the period under review.

The *EJ* states that the new South African education reform policies emerged from demands by the World Bank and the International Monetary Fund that resulted in increasing teacher retrenchments (*EJ*, 1995a). It was, according to the *EJ*, a period when "the realisation of a fully democratic education system in a non-racial democracy was thwarted" (*EJ*, 1995a:2-3). Very few academics spoke out against the new PE system in South African schools. Government ignored those who did, such as Dr Karel van Deventer of Stellenbosch University:

> "Government needs to be convinced to invest in initial and in-service professional training and development of teachers and should recognise that failure to provide PE costs more in health care … research to improve the effectiveness and quality of PE should [therefore] be supported by the authorities" (Van Deventer, 1998/99:100,101).

Education critics stated that the OBE framework was designed in isolation from the concrete context of teaching, learning and training (Isaacs, 2013). Further, it was the state, and, in effect, the ANC, rather than education-driven imperatives, that directed policy – and the state had an academic support base that obfuscated criticism. One such supporter stated:

> "The ANC"s implementation plan for education and training provided a well- planned and visionary guideline, which was to be of paramount importance in developing changes in the South African education system. Stakeholder participation, transparency and inclusive development were novel modes of operation in this country. From its inception, the new education system was participatory and consultations were widely held" (Rooth, 2005:29).

Alternative voices asserted that the new regime pushed ahead with OBE because of its determination to demonstrate that visible change had taken place in the education scene before its term of office came to an end in 1999 (Spreen & Vally, 2003). Political representation, rather than meaningful involvement in policy development, provided sufficient proof of consultation (Greenstein, 2003). Critics remarked that the OBE policy

was implemented with "much confusion, some resistance and significant trepidation" (Spreen & Vally, 2003:450). Alexander claims that the post-apartheid state thrust the idea of PE becoming part of the LO learning area upon them. The NDoE invited SADTU to the NETF in 1994. Alexander was nominated at the SADTU national congress of the same year to represent the Union at the NETF, with the mandate to agitate for a change in the philosophical underpinnings of PE (Alexander, 2011). Subsequently, despite Alexander being appointed senior PE advisor in the WCED, he was unable to prevent the subject from being collapsed

into LO.

## WHY PE COULD COLLAPSE INTO LO WITHIN AN OBE FRAMEWORK

A former HOR official submitted a mini-thesis entitled "Empowering teachers to implement the LO learning area in the senior phase of the General Education and Training Band". A finding of the said work was that "teachers were not ready and sufficiently prepared to implement LO and lacked knowledge and a positive attitude towards the subject" (Christiaans, 2006:167). However, departmental officials were also not pedagogically prepared for the implementation of LO and remained silent on its shortcomings.

Initially, universities supported the idea of adopting an OBE approach towards PE, but later a few raised concerns about the development. In 1997, Van Deventer"s research-based article appeared in the *South African Journal for Research in Sport, Physical Education and Recreation Social Sciences* (*SAJSPER*). He answered the question: "What must policy makers in South Africa do, through PE as a school subject, in order to contribute to a purposeful national curriculum?" (Van Deventer, 1997:66) with the following statement:

> "OBE provides a new departure and approach to teaching and learning experiences. This new approach presents programme designers … within LO, the ideal opportunity to design inclusive and contextual learning programmes … on micro level, C2005 offers teachers the opportunity to be, not only implementers, but development agents that are able to develop relevant learning programmes for the school and community in a dynamic and creative way" (Van Deventer, 1997:66).

The above did not materialise and, instead, a major characteristic of post-apartheid South Africa was the intense contestation between political parties for control over education, with the politicians concerned seldom consulting with the policy implementers, referring to the teachers involved (Isaacs, 2013). One of the three bills that were passed in 1995, the National Education Policy Bill "effectively placed almost complete power in the hands of the National Minister of Education" (*EJ*, 1995c:4). The new ruling party"s promise of free compulsory education had not materialised and, instead, the National Minister of Education, Professor Sibusiso Bengu, launched a teacher rationalisation scheme to cut the number of teachers by offering voluntary severance packages (VSPs), in what was commonly known as a form of rationalisation.

Opposition to the VSPs was voiced across the South African political spectrum, initially including SADTU (*Burger*, 1993a; *Cape Argus*, 1997). Some of the best and the most experienced teachers took the packages concerned (Johnson, 2009). As was mentioned

earlier, 2931 teachers received VSPs under the administration of the HOR (Motala & Tikly, 2003). The teachers concerned included Frank Stoffels, Jumat Idas and Andre Skein, who were senior PE curriculum advisors in the HOR and Cape Education Department, respectively. Teacher training colleges that offered PE specialist training

were merged, and the subject was discontinued (*EJ*, 1997c). This move occurred despite the fact that teachers generally had poor qualifications. This situation was exacerbated by the removal of 16 000 educators from the profession by means of a system of rationalisation (which amounted to leaving many schools without PE instruction) that took place across all the former „racially" defined education departments. The remaining teachers had to implement C2005 under conditions of poverty, social decay and poor school facilities (*EJ*, 1997a).

Ideas of a South African „rainbow nation" characterised the „era of transformation", during which national South African sports teams "did much to develop a sense of national pride and nation building" (Griffiths & Pienaar, 1999:8). The rainbow theme also infiltrated the South African PE arena and the 7th International Rainbow Week (consisting of a children"s gathering, an exhibition and a symposium) was held in Cape Town from 3 to 10 December 1995 (Katzenellenbogen, 1995). However, no implementation of the findings that were delivered in research papers at the rainbow Week Symposium was visible in schools.

The development of a South African national sport pride was promoted through the staging of mega events and through the country"s re-admittance to international participation in 1993. The ANC called for the lifting of the sport, economic and air travel boycotts against South Africa without the consent of the organisation behind the anti-apartheid sport struggle, namely the South African Council on Sport (SACOS) (*Burger*, 1993c). The opening up of opportunities in this direction paved the way for the establishment of a consumerist professional sport set up to swamp mass-based PE, allowing learners to work towards improving their own health by means of participating in sporting activities. Before the 1994 elections, prominent ANC officials lobbied for South Africa"s return to international cricket and in November 1991, the country toured India for the first time (Odendaal, 2003).

The period immediately before the advent of democracy in 1994 was characterised by "three times more foreign sport people visiting South Africa in 1992 than in 1991, while four times more South Africans travelled abroad" (Booth, 1995:107). During the period under review, South Africa hosted and won the Rugby World Cup (1995), participated in and won the Africa Cup of Nations Soccer Tournament (1996), and bid unsuccessfully for the Olympic Games in Cape Town, at the projected expense of R6 billion (*EJ*, 1995b; Blades, 1998; Griffiths & Pienaar, 1999). The cricket administrator Ali Bacher says of the period stated that "the country was awash with the „Madiba magic"… and South African sport looked in excellent shape" (Hartman, 2004: 316). In contrast, the new government did not express the same level of concern regarding PE, a mass-based health activity.

In 1995, the *EJ* asserted that the ruling party had a deliberate strategy, which it had designed before1994, not to transform certain key centres, including Model C (former Whites-only) schools, and that the overall South African education framework, policy and structures were flawed (*EJ*, 1995c). The last education minister the apartheid regime, Piet Marais, had made it clear that the government was intent on maintaining Model C schools that allowed for the „free association" of distinctive cultural groups (*Burger*, 1993b; *Cape Argus*, 1993b). The

establishment of the NETF also deeply pleased Marais (*Burge*r, 1993d). The inauguration of the NETF had implications for poor schools that originated in the former Black education departments, which elicited the following comment from Johnson:

> "The real problem lay in … poorly educated and poorly motivated teachers, obstructive teaching unions, gross abuse and indiscipline of every kind and all the normal kinds of corruption and maladministration, which made these (black and poor) schools a nightmare. Only a tough-minded emphasis on higher standards would turn things around" (Johnson, 2009:462).

Johnson reasoned that the ANC government was reluctant to take the route of meritocracy, because doing so would have made for "immediate casualties – irredeemably bad teachers and weak students – and would have [had] to rate merit over affirmative action … no ANC minister had the stomach for that" (Johnson, 2009:462). The post-apartheid government was unwilling to accept the idea of competency as being the sole criterion for social cohesion, and appointed PE subject advisors on the basis of their union affiliation (Davenport, 1998). Academic qualifications and experience were secondary factors with regard to senior appointments. When South African PE officials such as Andre Skein warned that the subject would wither if it placed within the LO learning area, they were simply ignored (Skein, 2011). Thus PE became situated within the LO learning area for lack of critical opposition.

## CONCLUSION

The above research has shown how PE was fused into the LO learning area in the transition to the OBE system. The solution to the problem of the apartheid legacy of educational inequality and to the lack of purposeful PE participation opportunities was sought through positioning PE within the LO learning area, as part of Curriculum 2005. Despite much scepticism, the new educational authorities pushed ahead with implementing an educational policy that "hinged largely on political symbolism rather than [on] the substance of change in education … resulting in a distance between policy and practice" (Jansen, 2001:41). The above-mentioned development, combined with the rationalisation of educators, compelled schools to reassess their academic needs and to seriously consider the feasibility of offering non-examination subjects, such as PE. The subject needed a "dedicated leadership, i.e. a sufficient number of individuals in influential positions who had faith in the importance of PE … and who had perseverance to wear down the prejudices which exist in the employment institutions" (Anthonissen, 1997:85). In the absence of such a "dedicated leadership", PE was integrated without much opposition into the LO learning area.

Under the apartheid regime, the majority of South African schoolchildren had no or scant purposeful opportunity to participate in PE. The post-apartheid regime was more concerned about promoting mega sport events and about appeasing the short-term demands of the teacher unions, in particular those of SADTU. Therefore, despite the change in government, the majority of South African children still lacked access to meaningful PE. During the period under review, most South African schoolchildren continued playing the same purposeless games in PE classes as they

had done during the apartheid era. Sadly, many played no games at all. Therefore, in concluding the current study, the research question can be answered as

follows: Symbolisms, which ignored the prospect of critical analysis, were the major driving force behind the collapse of PE as a school subject into the LO learning area.

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## APPENDIX

### Curriculum framework development of Physical Education

| Date | Learning Area & Subject | Comment | Source |
|---|---|---|---|
| December 1995 | Physical Education and Health (Fitness and Health; Creative Movement; Coordination and Control) | Document is primarily concerned with establishing broad principles, rather than detailed programmes. Prince (2011) asserts that no document has been released. | Greenstein *et al.* (1996:248,249) |
| | Arts and Movement (Visual, expressive and performing arts, theory of art and Physical Education) | Document released by the Curriculum Development Working Group of the National Curriculum Development Committee (NCDC) | Motala (1996:311) |
| 1996 | Arts and Movement/ | Learning Area Committee | Govender *et al.* |

| | | | |
|---|---|---|---|
| | Life Orientation | established. Develops specific outcomes for Life Orientation/ Arts and Movement | (1997:359) |
| March 1997 | Life Orientation | Launch of outcomes-based education | Greenstein (1997:373) |

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# A NON-LINEAR UNDERSTANDING OF GOLF PUTTING

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***ABSTRACT***

*The aim of this study was to investigate both golf putting precision and accuracy. A new approach is proposed using error ellipses and Fourier series to analyse product variable tendencies in golf putting performance. The sample consisted of 10 male golfers, adults (age=33.80±11.89 years), and volunteers, right handed and experts (10.82±5.40 handicap). Within this context, a ranking of all players, based on the precision and accuracy scores, was carried out, and the best three players with the highest performance, were highlighted. The results indicated that both precision and accuracy of putting performance was adjusted based on the variability conditions and task constraints. It is also noteworthy that the higher ranked*

*players were very regular and stable in their performance even under different practice conditions of variability. These methods may be applied to other sports that require the simultaneous analysis of the precision and the accuracy of a particular movement or motor skill.*

**Key words:** Golf putting; Performance analysis; Fourier series; Error ellipses.

## INTRODUCTION

The Professional Golf Association Tour (PGA), shows that golf putting represents almost 40% of the skills performed during the game (Alexander & Kern, 2005; Mackenzie & Evans, 2010). Both accuracy and precision are the main factors that may allow predicting the final outcome (Pelz, 2000). As accuracy is the degree of closeness to a predefined reference, it may be represented by the radial error to the hole (Dias & Mendes, 2010; Dias *et al*., 2011). Precision, on the other hand, is the degree to which repeated measurements under unchanged conditions presents the same result, which may be represented by the dispersion of the ball around the hole (JCGM, 2008). Therefore, a golf player may be accurate but not precise, precise but not accurate, neither, or both (Pelz, 2000).

No research, until now, analysed both accuracy and precision of golf players within the putting movement, while only a few in other sports were reported (Mendes *et al*., 2012; Dias *et al*., 2013). A way of measuring the precision and accuracy of a golfer during putting performance is by applying mathematical techniques (Vicente *et al*., 2010). One of the most

promising techniques applied to sport sciences is the Fourier series, which allows representing tendencies through temporal series (Vicente *et al*., 2010).

Many Fourier applications in different areas of investigations have been presented in the literature, namely in studies of heart rate, auditory and visual systems, temperature of the Earth‟s crust (Verbesselt *et al*., 2010), non-linear systems (Delignières *et al*., 2003), locomotion patterns (Hsiao-Wecksler *et al*., 2010), or team sport games (Kokubun *et al*., 1996).

Within golf research, Vicente *et al*. (2010) applied the Fourier series to analyse the putting performance of five novice players. The authors concluded that the Fourier series analysis allows understanding players‟ signatures, i.e. behaviour tendencies. Moreover, using the Fourier series transformed how some golf studies analysed the putting phases, namely the backswing, downswing, ball impact and follow-through, as well as the amplitude, duration, velocity and acceleration of movement (Mackenzie & Evans, 2010; Vicente *et al*., 2010).

Pelz (2000) claimed that a golfer who participates in the PGA Tour faces several constraints, being susceptible to a high variability of practice conditions that require constant adaptations. Therefore, the player is faced with multiple possible ball trajectories (either linear or curvilinear, i.e. angle), slopes (either ascending or descending), adverse weather conditions (sun, rain, wind and snow) and even different greens (short grass, high grass, ill-treated grass, grass with holes and sand,

among others) (Newell, 1986; Couceiro *et al*., 2013; Dias *et al*., 2013).

## AIM OF THE RESEARCH

The aim of this study was to analyse golf putting precision and accuracy. To do so, we first describe the adaptation of relevant putting variables regarding the distance to the hole and the addition of a slope and angle as constraints. Afterwards, a new approach using the error ellipses and Fourier series to respectively analyse both precision and accuracy are proposed regarding the product variables so as to assess the golf putting performance of expert players.

## METHODOLOGY

### Participants

The sample consisted of 10 volunteer male golfers who were adults (33.80±11.89 years), right handed and experts (10.82±5.40 handicap). By analysing the precision and accuracy scores of all players, it was possible to establish a ranking and, consequently, the three players with the better performance could be selected based on the radial error (Table 1). In that sense, the best three players, namely with lower radial error, were selected for an individual analysis in the results section.

***TABLE 1*: RANK OF BEST THREE PLAYERS BASED ON RADIAL ERROR**

| | | Radial error (mm) | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **(S)** | **(D)** | **P1** | **P2** | **P3** | **P4** | **P5** | **P6** | **P7** | **P8** | **P9** | **P10** |
| **S1** | D1 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 |
| **S1** | D2 | 40.13 | 87.80 | 31.30 | 35.00 | 210.57 | 215.53 | 378.67 | 705.63 | 62.27 | 320.80 |
| **S1** | D3 | 0.00 | 283.27 | 455.30 | 20.80 | 489.97 | 359.17 | 455.83 | 812.80 | 35.53 | 365.60 |
| **S1** | D4 | 0.00 | 281.37 | 337.93 | 174.20 | 352.03 | 560.17 | 459.37 | 1973.93 | 12.90 | 1174.63 |
| **S2** | D2 | 155.43 | 105.03 | 53.10 | 37.17 | 404.53 | 70.90 | 115.40 | 363.60 | 79.27 | 123.33 |
| **S2** | D3 | 211.97 | 231.93 | 39.87 | 41.70 | 531.73 | 364.43 | 437.50 | 979.83 | 333.20 | 67.77 |
| **S2** | D4 | 279.70 | 356.83 | 175.83 | 203.40 | 979.20 | 424.17 | 1027.43 | 1368.83 | 348.40 | 109.53 |
| **S3** | Ang. 1 | 433.60 | 342.83 | 304.17 | 540.03 | 480.73 | 280.33 | 522.93 | 606.30 | 515.13 | 457.47 |
| **S3** | Ang. 2 | 994.60 | 413.60 | 773.17 | 468.43 | 528.37 | 333.23 | 604.50 | 1264.20 | 621.50 | 710.50 |
| | **Mean** | 235.05 | 233.63 | 241.19 | 168.97 | 441.90 | 289.77 | 444.63 | 897.24 | 223.13 | 369.96 |

(S)= Study (D)= Distance P=Player mm= Millimetres 0.00 = zero error

This study was conducted within the guidelines of the American Psychological Association and the protocol received approval from a local university ethics committee. All players signed a university-approved ethical consent form respecting the Helsinki Declaration. All tests were conducted in accordance with the ethical guidelines set by the University of Coimbra.

### Task and apparatus

The participants executed the task on an indoor rectangular green carpet, which produced a fast putting surface (with an approximate stimp of 10). The carpet was 10 m long and 2 m wide with a thickness of 4 mm (Dias *et al*., 2011).

Four circles with the size of a golf ball were drawn on the carpet to point the exact location for the execution of the putting trials (1, 2, 3 and 4 m away from the hole). For the second and third studies, a slope, where its legs measured respectively 1 metre and 10 cm, was placed beneath the carpet. In that sense, the golf slope gradient was 20%. A platform of 4 m in length was attached to the slope. Finally, 2 circles were drawn on the left and right side of the carpet at 25 degrees in relation to the hole (Figure 1).

**Data recording**

Players‟ putting executions and final outcome were captured using 2 digital cameras (Casio Exilim/High Speed EX-FH25). Camera 1 was placed in a frontal position at a distance of 4 m from the player. Camera 2 was used to capture a lateral and superior view of the experimental apparatus to record the radial error and the ball‟s trajectory (Figure 1).

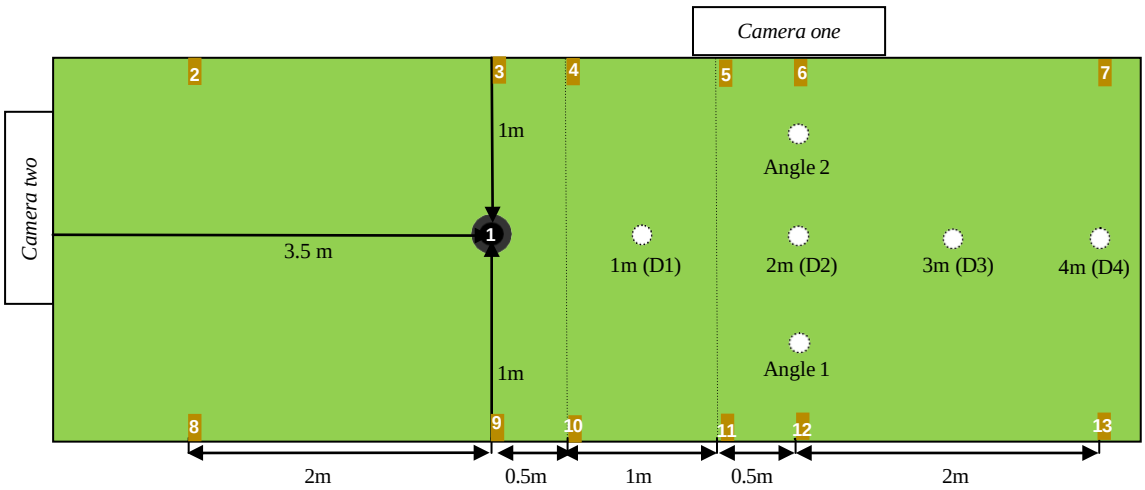



***FIGURE 1*: UPPER VIEW OF EXPERIMENTAL APPARATUS AND REFERENCE**

Both cameras were static, at the same positioning, height and angle. Images were processed at 210 Hz (camera 1), which allowed a detailed analysis of the putter movement (Delay *et al*., 1997; Coello *et al*., 2000), and 30 Hz (camera 2) to analyse the trajectory of the ball (Dias *et al*., 2013). To support the data analysis, 13 reference points were marked on the green carpet, corresponding to the real coordinates of the experimental device (Figure 1). The centre of the hole is the reference for the adopted coordinate system, with the point (0.0).

**Procedures**

The following procedures served in conducting the research:

- The task was performed in the gymnasium;

- The players were analysed one-by-one;
- Each player was informed about the main goal of the study;
- Each participant performed 3 adaptation trials at a distance of 2.20 m;
- 30 Trials were performed at each distance of 1, 2, 3 and 4 m for study 1;
- 30 Trials were performed at each distance of 2, 3 and 4 m for study 2 (with a slope);
- 30 Trials were performed on the left and right side of the slope to 25 degrees in relation to the hole for study 3;
- The three studies for each player were performed in the same session.

**Analysis of data**

***Radial error***

The radial error is an important form of quantitative evaluation of a player‟s error during practice in the laboratory or field, namely self-learning situations (Dias & Mendes, 2010). In that sense, recent works about golf putting adopted the radial error as part of the player‟s

performance analysis (Dias *et al*., 2011; Couceiro *et al*., 2012; Mendes *et al*., 2012). In this study, the radial error was obtained using Pythagoras‟ theorem, as it is the hypotenuse of the right triangle relating to both legs defined by lateral error and longitudinal error (Couceiro *et al*., 2012).

**Error ellipses**

The centre of the ellipse was calculated using the radial error of the 30 trials with MatLab (Vicente *et al*., 2010). Afterwards, by analysing the ellipse‟s size and area, one can quantify the accuracy and precision of the golf putting considering the hole (Couceiro *et al*., 2012; Dias *et al*., 2013).

**Fourier series**

By using the Fourier series, it was possible to analyse the putting performance tendencies of the players. Any tendency may be approximated by a truncated Fourier series for the *n* degree, adjusted to the non-linear least squares (equation 1). In this study, the Fourier series were used to analyse both the maximal velocity of the putting performance and the radial error over the 30 trials for each practice condition (Maor, 2002; Ardito *et al*., 2008):

$$q_n(t) = a_0 + \sum^{n} \left( a_j \cos\left( \frac{j2\pi}{T} \right) \right)$$

$t \mid + b_j \sin \mid_{T}$

$t$ ||

(Equation 1)

Thus, T (Trials) = 30, the coefficients $a_0$, … , $a_n$ e $b_1$, … ,$b_n$ are obtained using the *Trust Region* method, solving the problems of the non-linear least squares (Maor, 2002; Ardito *et al*., 2008).

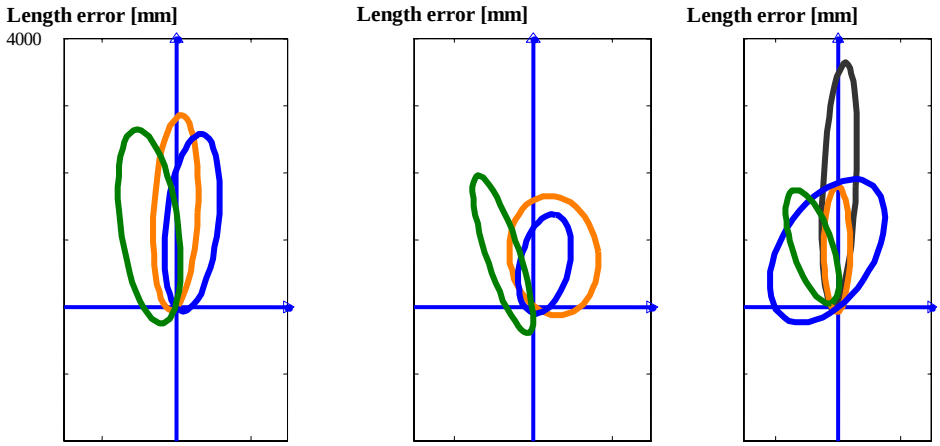
The choice regarding the process variable selected was supported by Pelz (2000), that considers the maximal velocity as one of the most important variables on golf putting (Vicente *et al*., 2010; Couceiro *et al*., 2013). The maximal velocity was retrieved directly from the direct acquisition of the golf club using Camera 1 (cf., Data Recording section) (Couceiro *et al*., 2013)**.** For that purpose, an auto-tracking methodology that automatically compares the current frame with the previous one was developed under MatLab (Dias *et al*., 2013). Based on the work of Couceiro *et al*. (2013), the pixel/frame value of the putter movement was converted to metric units (m/s).

## RESULTS

The results regarding the accuracy and precision performance for each player will be presented in this section.

### Error ellipses

The length and width error ellipses of the players‟ performance could be seen on the Figure 2 and Table 1.



4000

4000

3000

3000

3000

2000

2000

2000

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0 0 0

-1000

-1000

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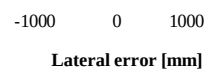
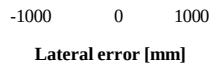
-2000


-1000
0
1000
Lateral error [mm]

-2000


-1000
0
1000
Lateral error [mm]

-2000


***FIGURE 2*: LENGTH AND LATERAL ERROR OF PLAYERS 1, 2 AND 3 ON THREE STUDIES**

Table 2 presents the accuracy and precision performance for each player, while also showing the lowest number of the ellipses obtained and their lower dimensions of all practice conditions.

***TABLE 2*: ACCURACY AND PRECISION METRICS OF ERROR ELLIPSES OF PLAYERS 1, 2 AND 3 ON THREE STUDIES**

| Study (S) | Player 1 | | | Player 2 | | | Player 3 | | |
|---|---|---|---|---|---|---|---|---|---|
| | area [$m^2$] | $e_C$ [$m^2$] | $\theta_C$ [°] | area [$m^2$] | $e_C$ [$m^2$] | $\theta_C$ [°] | area [$m^2$] | $e_C$ [$m^2$] | $\theta_C$ [°] |
| S1_1m | 0.0 | 0.0 | 90 | 0.0 | 0.0 | 90 | 0.0 | 0.0 | 90 |
| S1_2m | 0.0 | 0.0 | 90 | 0.0 | 0.0 | 90 | 0.0 | 0.0 | 90 |
| S1_3m | 0.0 | 0.0 | 90 | 0.0 | 0.0 | 90 | 0.0 | 0.0 | 90 |
| S1_4m | 0.0 | 0.0 | 90 | 0.0 | 0.0 | 90 | 0.0 | 0.0 | 90 |
| S2_2m | 0.0 | 0.0 | 90 | 0.0 | 0.0 | 90 | 0.0 | 0.0 | 90 |
| S2_3m | 0.0 | 0.0 | 90 | 0.0 | 0.0 | 90 | 1.53 | 1.79 | 88 |
| S2_4m | 1.35 | 1.40 | 90 | 1.58 | 0.80 | 70 | 0.61 | 0.85 | 90 |
| S3_ Angle 1 | 1.46 | 1.27 | 80 | 0.74 | 0.65 | 76 | 2.76 | 0.84 | 101 |
| S3_ Angle 2 | 1.77 | 1.24 | 107 | 0.81 | 0.86 | 116 | 0.89 | 0.98 | 114 |

S= Study m= metre area [$m^2$] – Ellipse area $e_c$ [$m^2$] – Ellipse centre $\theta_C$ [°] – Angle of the ellipse centre for the hole

Considering the error ellipses, the results suggest that expert players were very regular and stable even when performing under different practice conditions of variability. For example, Player 2 showed higher accuracy (ellipse centre closer to the hole) and precision (average of the ellipse area was lower than the others, thus meaning an inferior dispersion). Nevertheless, in this specific case beyond the absolute error, an attempt was made to represent a stability and regularity of the golf players. In that sense, the ellipses allow the identification of a kind of individual „signature" of the player.

**Fourier series**

Using the Fourier approach can possibly identify some individual signatures of the players crossing 2 kinds of important and different information (Kokubun *et al*., 1996). Analysing only the velocities would possibly result in some misinformation about the whole characteristic of the player, because 2 players could have the same patterns in the velocity behaviour but have a different kind of final result, for example radial error (Dias *et al*., 2011).

**Analysis of Study 1 for the better three players**

Each study corresponds to a specific distance, maximal velocity and radial error. Therefore, a specific legend is presented for the figure about the data. In the case without radial error, it is not possible to perform the curve fitting. Thus, it is normal that in some cases possibly only 2 lines would be seen.

**Player 1**

For distance 1, Player 1 was completely effective not having missed a single trial, thus obtaining an error of zero. Considering the maximal velocity (Figure 3), the player showed a high decreasing tendency up to trial 8, which increased then up to trial 18 and decreased again at the end (trial 30).

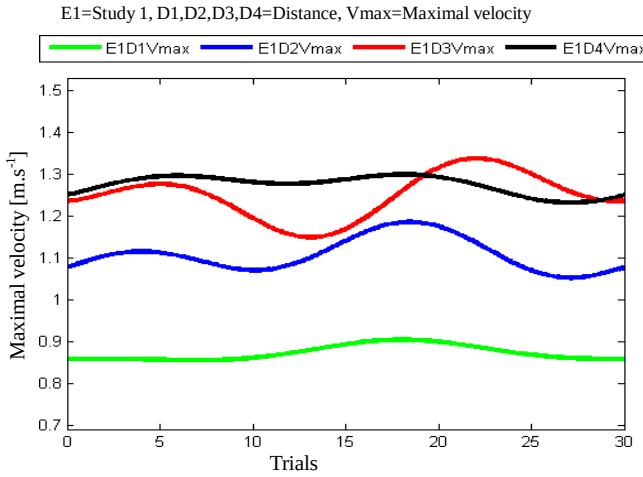



***FIGURE 3*: MAXIMAL VELOCITY [m.s$^{-1}$] TENDENCY OF PLAYER 1 IN STUDY 1**

For distance 2, 29 trials were performed without any error. The maximal velocity changed during the 30 trials, with an increase up to trial 5, a decrease up to trial 10, an increase again up to 19 and a decrease during trial 20 through to the end. For distance 3, all trials were performed without any error. The maximal velocity increased up to trial 5, decreased up to trial 13, increased again up to trial 22 and decreased to the finish. Similar to distance 3, in distance 4, the error was zero. Finally, the maximal velocity changed during the 30 trials, increasing up to the 6$^{th}$, decreasing up to trial 12, increasing again to trial 19 and decreasing to the finish.

**Player 2**

For distance 1, Player 2 was completely effective not having missed any trial, thus obtaining an error of zero. Considering the maximal velocity (Figure 4), the player showed a constant tendency up to trial 6, an increase to trial 15, a decrease to trial 24 and an increase to the finish (trial 30).

At distance 2, 28 trials were performed without any error. The maximal velocity

changed during the 30 trials, decreasing up to trial 7, increasing up to trial 15, decreasing again up to the 23 and finished with an increase. For distance 3, the player missed one single trial. One singular mistake was not enough to change the tendency, thus maintaining the error close to zero. Considering the maximal velocity, Player 2 showed a decreasing tendency up to trial 8, an increase up to trial 13, a decrease to trial 19 and an increase to the finish.

For distance 4, the player showed a decreasing tendency of the radial error up to trial 5, an increase to trial 14. This was followed by a decrease of the error up to trial 21 and an increase up to the finish. Considering the maximal velocity of Player 2, there were decreases until trial 10, increasing up to trial 21, and then decreasing again to the finish.

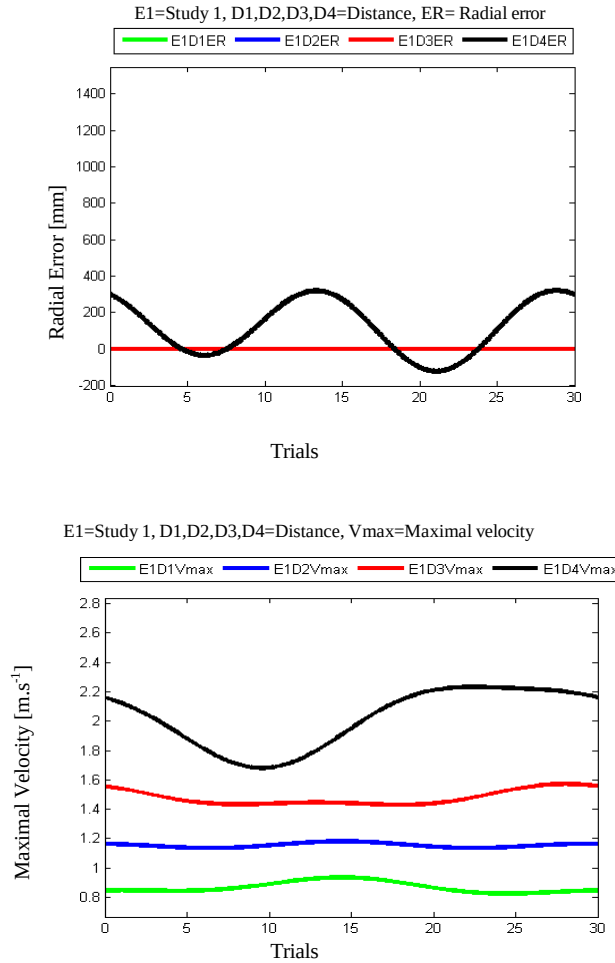



***FIGURE 4*:** **RADIAL ERROR TENDENCY [mm] AND MAXIMAL VELOCITY [m.s$^{-1}$] OF PLAYER 2 IN STUDY 1**

**Player 3**

For distance 1, Player 3 just missed one trial. Once again, one singular mistake was

not enough to change the tendency, thus maintaining the error close to zero. Considering the maximal velocity, the player showed an increasing tendency up to trial 11, a decrease to trial 17, an increase to trial 23 and a decrease to the finish (Figure 5).

For distance 2, the player missed three trials. Nevertheless, only three mistakes were not enough to change the tendency, thus maintaining the error close to zero. It is possible to observe an increasing tendency of the radial error between trial 15 and 22, which afterwards decreased to the finish. Considering the maximal velocity, the player showed a decreasing tendency up until trial 18, then an increase to the finish.

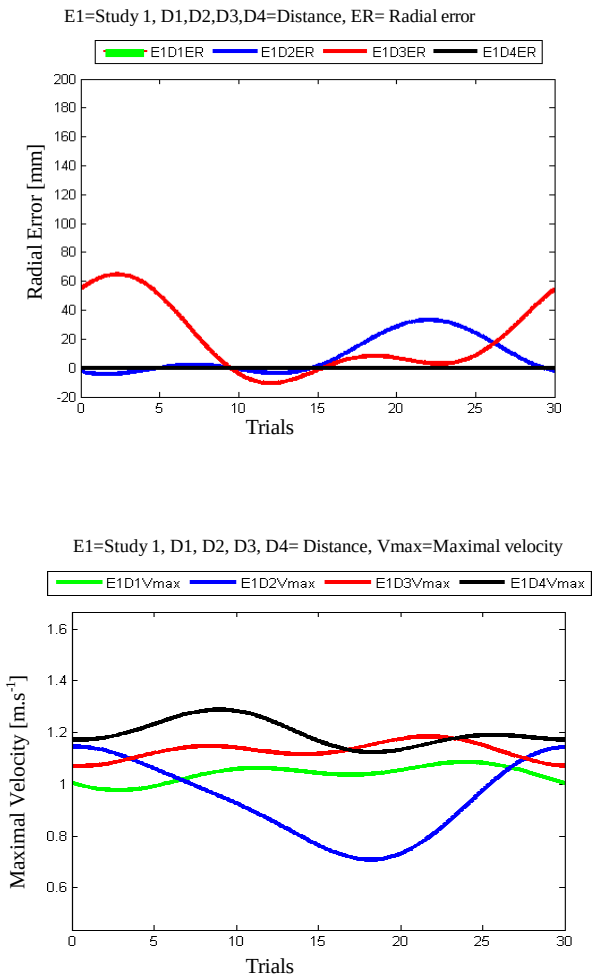



***FIGURE 5*:** **RADIAL ERROR TENDENCY [mm] AND MAXIMAL VELOCITY [m.s-1] OF PLAYER 3 IN STUDY 1**

For distance 3, the player showed a decreasing tendency of the radial error until trial 10, maintaining close to zero until trial 24. In the last trials, the radial error tendency

increased until the finish. Considering the maximal velocity, Player 3 showed an increase until trial 8, and a decrease to the finish. In distance 4, the error was zero. The maximal velocity changed during the 30 trials, increasing until trial 9, decreasing to trial 18 and finishing by an increase.

**Analysis of Study 2 for the better three**

**players Player 1**

For distance 2, Player 1 increased the radial error until trial 7, decreasing to trial 12 and maintaining this until the end. The maximal velocity showed a decreasing tendency until trial 22 then increased to the end (Figure 6).

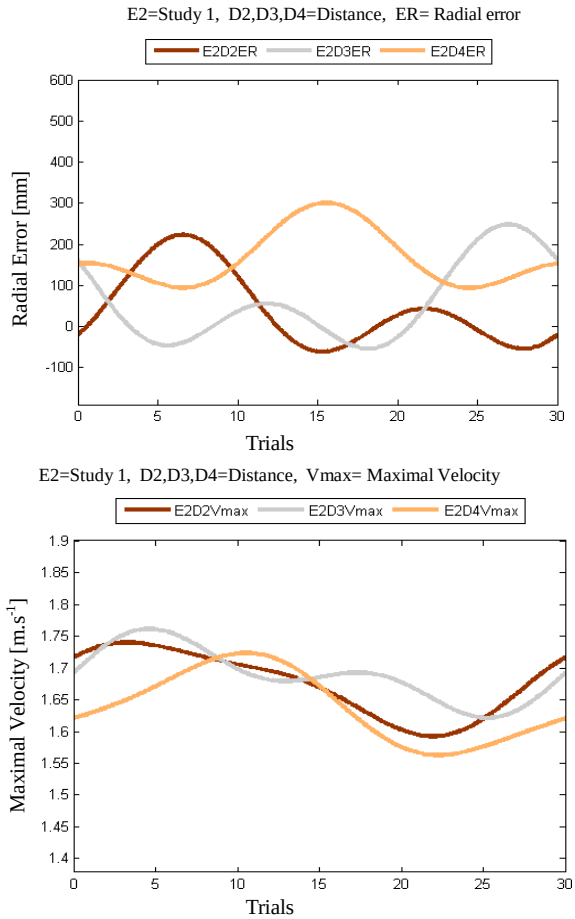



***FIGURE 6*: RADIAL ERROR TENDENCY [mm] AND MAXIMAL VELOCITY [m.s$^{-1}$] OF PLAYER 1 IN STUDY 2**

For distance 3, Player 1 decreased the radial error until trial 5, increased it to trial 12

and decreased it until the end. The maximal velocity showed an increasing tendency to trial 5, decreased to trial 13, maintaining the velocity until trial 18, which decreased again to 25 and finishing with an increase. Considering the radial error on distance 4, the player showed a slow decreasing tendency to trial 6, an increase until trial 16, a decrease to trial 25 and finishing with an increase. The maximal velocity showed an increasing tendency to trial 11, a decrease until 22 and finished with an increase.

**Player 2**

The radial error for distance 2 showed a decreasing tendency to trial 6, an increase to trial 14, a decrease until trial 21 and finished with an increase. The maximal velocity showed a slow increasing tendency until trial 3, a decrease to trial 10, an increase until trial 18, a decrease again to trial 23 and finished with an increase (Figure 7).

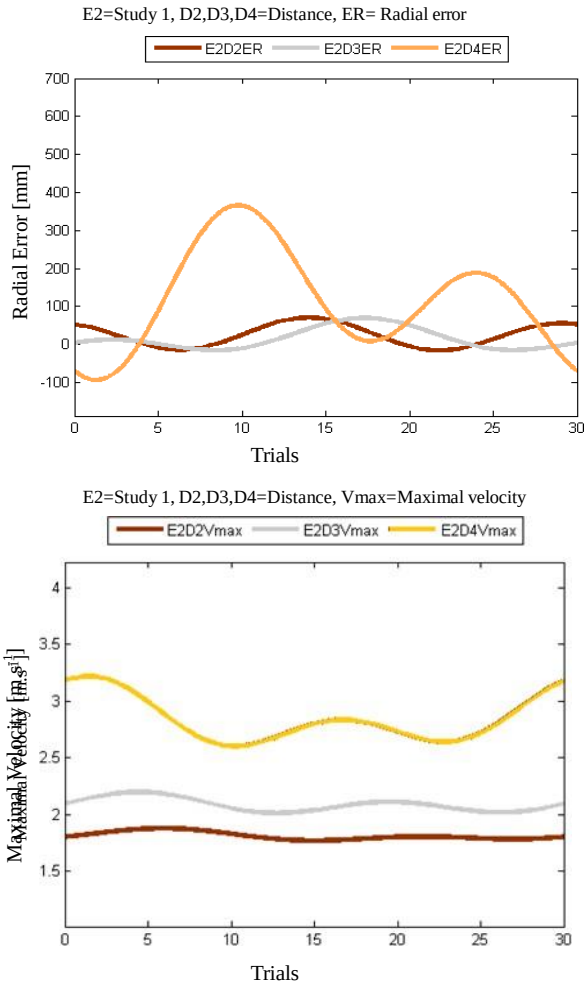



***FIGURE 7*: RADIAL ERROR TENDENCY [mm] AND**

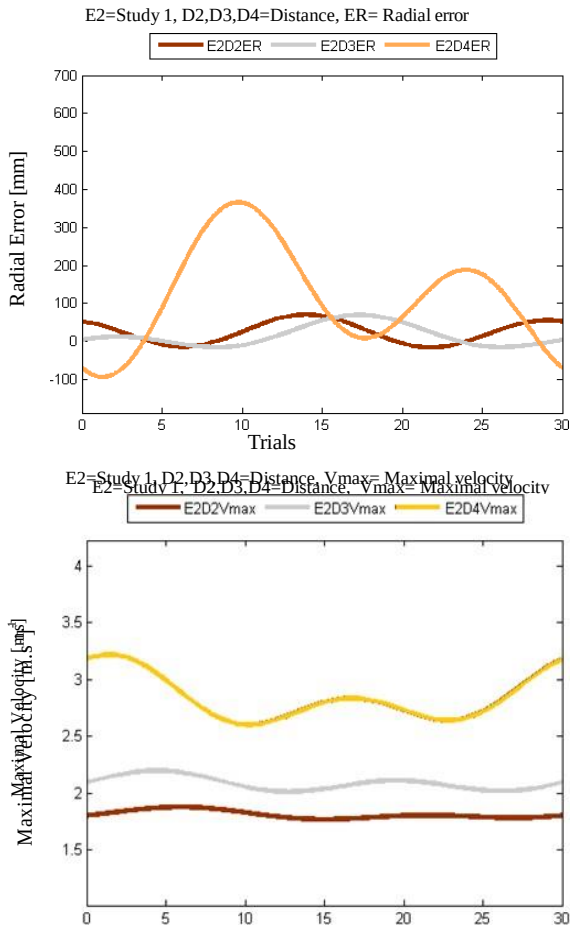
**MAXIMAL VELOCITY [m.s$^{-1}$] OF PLAYER 2 IN STUDY 2**

For distance 3, the radial error maintained almost nil until trial 12, increased to trial 17, decreased to trial 23 and finished by almost maintaining nil. The maximal velocity showed an increasing tendency to trial 5, a decrease until trial 13, an increase to trial 20, a decrease again to trial 26 and finished with an increase. For distance 4, the player showed a radial error increase until trial 10, a decrease to trial 17, an increase again to trial 14 and finished with a

decrease. The maximal velocity decreased to trial 10, increased until trial 17, decreased to trial 13 and finished with an increase.

**Player 3**

During distance 2, Player 3 showed a decreasing radial error until trial 6, an increase to 14, a decrease until trial 12 and increased to the finish. The maximal velocity slowly increased to trial 7, decreased to trial 14, increased to trial 21 and finished with a decrease (Figure 8).



Trials

***FIGURE 8*: RADIAL ERROR TENDENCY [MM] AND MAXIMAL VELOCITY [m.s$^{-1}$] OF PLAYER 3 IN STUDY 2**

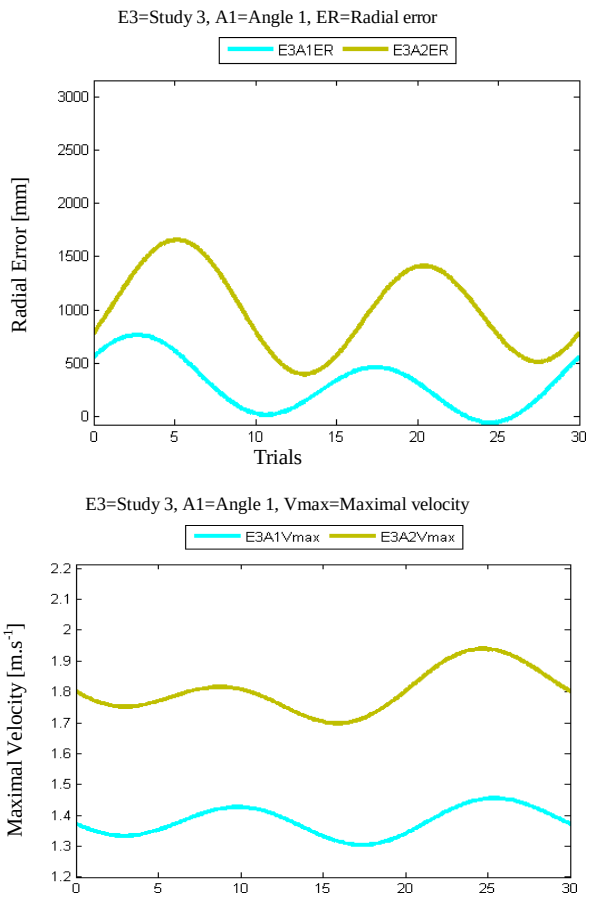
For distance 3, the player showed an almost nil radial error until trial 12, which increased to trial 17, decreased to trial 23 and maintained almost nil until the finish. The maximal velocity increased to trial 5, decreased to trial 13, increased again to trial 20, decreased until trial 26 and finished increasing. During distance 4, the player showed an increasing tendency of

radial error up to trial 10, a decrease to 17, an increase to 24 and finished decreasing. Finally, the maximal velocity decreased to trial 10, increased to 17, decreased to 23 and an increase to the finish.

**Analysis of Study 3 for the better three**

**players Player 1**

For angle 1, the player showed a decreasing tendency of radial error to trial 10, an increase up to trial 18, a decrease to trial 24 and an increase to the finish. The maximal velocity increased to trial 10, decreased to 17, an increase to 26 and a decrease to the finish (Figure 9)[1].



Trials

***FIGURE 9*: RADIAL ERROR TENDENCY [mm] AND MAXIMAL VELOCITY [m.s$^{1}$] OF PLAYER 1 IN STUDY 3**

[1] When the curve achieves negative values (below to 0) is assumed a great number of the success trials (radial error equal to 0). When this happens, it is possible to observe a constant zero tendency over the interval where the curve achieves negative values.

For angle 2, the player showed an increasing tendency of radial error until trial 5, a decrease up to trial 13, an increase to trial 21, a decrease again up to trial 27 and an increase to the finish. The maximal velocity increased to trial 9, decreased to trial 16, increased again up to trial 25 and finished with a decrease.

**Player 2**

For angle 1, Player 2 showed a decreasing tendency for radial error up to trial 13, which increased up to 23 and maintained it to the finish. The maximal velocity slowly increased up to trial 5, decreased to 11, increased to 18, decreased until 26 and finished with an increase (Figure 10).

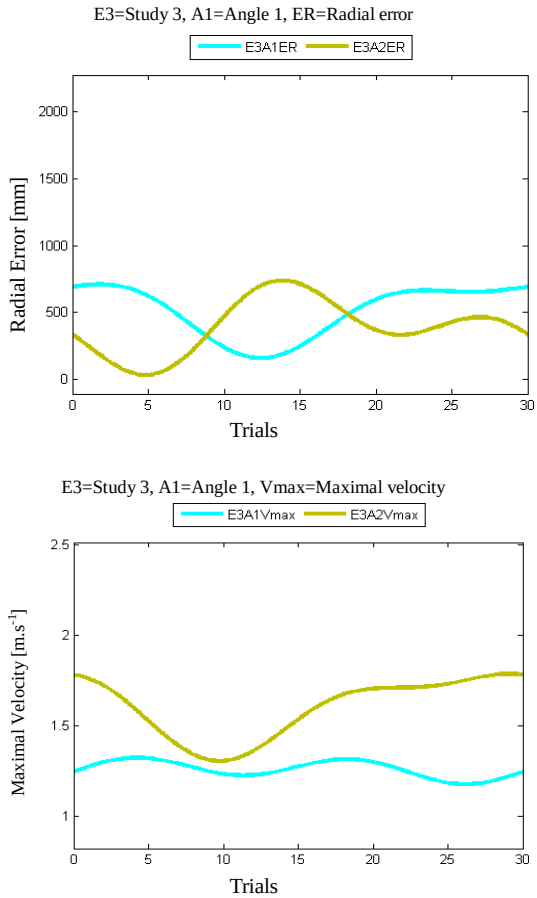


***FIGURE 10*: RADIAL ERROR TENDENCY [mm] AND MAXIMAL VELOCITY [m.s$^{-1}$] OF PLAYER 2 IN STUDY 3**

For angle 2, the player showed a radial error decreasing tendency up to trial 5, an increase to 14, and a decrease up to trial 21, which increased again up to trial 27 and finished with a decrease. The maximal velocity showed a decreasing tendency up to trial 10 and finished with an increase.

**Player 3**

For angle 1, Player 3 showed a decreasing tendency for radial error up to the trial 6, followed by an increase to trial 13, a decrease up to trial 20 and finished with an increase. The maximal velocity decreased up to trial 3, increased to trial 11, decreased again up to trial 18, increased up to trial 26 and decreased to the finish (Figure 11). Despite the velocities, there was an adjustment over the practice conditions.

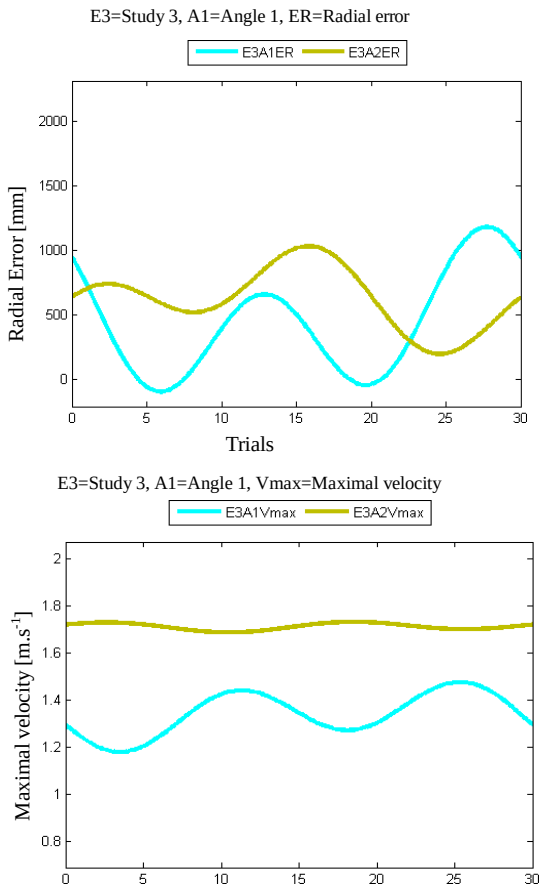


***FIGURE 11*: RADIAL ERROR TENDENCY [mm] AND MAXIMAL VELOCITY [m.s$^{-1}$] OF PLAYER 3 IN STUDY 3**

Regarding the second angle, the player tended to decrease the radial error up to trial 8 and increased it up to trial 16. Henceforth, the error decreased up to trial 25 and increased once again until the end of the trials. Maximum velocity presented a downward trend up to trial 10 and slightly increased up to trial 18. Afterwards, the maximum velocity slowed down until trial 25 and increased again until the end of the trials.

## DISCUSSION AND CONCLUSION

No research, until now, has analysed both accuracy and precision of golf players within the putting movement, while only a few have been reported in other sports (Mendes *et al*., 2012; Dias *et al*., 2013). A way of measuring the precision and accuracy of a golfer during putting performance is by applying mathematical techniques (Vicente *et al*., 2010). With reference to the latter, one of the most promising techniques applied to the sport sciences is the Fourier series, which allows representing tendencies through a temporal series (Kokubun *et al*., 1996; Vicente *et al*., 2010).

Even under those conditions, there is a large „void" in the literature regarding the performance analysis of golf putting using non-linear methods to understand the accuracy and precision of top-ranked players (Kokubun *et al*., 1996; Mackenzie & Evans, 2010). Hence, one could speculate that what actually matters in golf is simply to put the ball into the hole without any concern about the motor performance or the ball"s trajectory (Pelz, 2000; Wulf & Su, 2007; Dias *et al*., 2011).

The combination of the aforementioned aspects led this research to implement new performance analysis methods that include the Fourier series and the error ellipses. Operationally, and based on the mathematical models of Maor (2002), Ardito *et al*. (2008) and Vicente *et al*. (2010), the analysis of both movement velocity and radial error was investigated (Pelz, 2000; Dias *et al*., 2013). Therefore, the expectation was that, even when facing different practice conditions of variability, the players were able to retain their precision and accuracy during the performance (Pelz, 2000; Davids *et al*., 2008; Dias & Mendes, 2010).

It is noteworthy that the „motor variability" aspect was envisaged considering that the game of golf may require a constant stability and performance of golfers (Perkins-Ceccato *et al*., 2003; Poolton *et al*., 2006). For instance, players are under several competing pathways (linear or curvilinear) and slopes (ascending or descending), adverse weather conditions (sun, rain, wind and snow) and different greens (short grass, tall poorly treated with holes and sand) (Pelz, 2000; Dias *et al*., 2011, 2013).

Under these assumptions, the results of this study indicate that it was possible to observe four tendencies in maximum velocity during 30 trials. For instance, during Study 1 the radial error was close to zero for all three of the players measured. This maximal velocity fluctuation, which was similar to the radial error tendency, may

suggest a level of self-organisation over the practice conditions, by trying to adjust their movement to improve the output (Davids *et al*., 2008; Dias *et al*., 2013). Thus, these outcomes suggest that studying only the product variables may not be enough for a deeper understanding of sports (Mendes *et al*., 2012; Couceiro *et al*., 2013; Dias *et al*., 2013). The Fourier analysis allows for an observation of the

variation over time, thus explaining, to some extent, the unpredictability of human movement behaviour (Kokubun *et al*., 1996; Dias *et al*., 2011).

The experimental results also suggest that expert players are very consistent and stable even when performing under different practice conditions of variability as the ellipses and the Fourier series show. One could assume that the precision and accuracy of golfers were adjusted to the practical conditions and constraints of the task (slope and angle) (Newell, 1986; Davids *et al*., 2008). Moreover, the error ellipses can be considered a supplementary method to further understand the accuracy and precision of the practice condition and possible patterns (Mendes *et al*., 2012). Hence by using these two methods (Fourier series and Error Ellipses), it is feasible to suggest that the information provided is important and gives a new kind of feedback about golf putting performance (Kokubun *et al*., 1996; Mackenzie & Evans, 2010).

Finally, it is concluded that the performance analysis on golf putting should benefit from the development of mathematical methods that would allow assessment of the precision and the accuracy of players simultaneously. Henceforth, these methods could also be applied to other sports that require the simultaneous analysis of the precision and the accuracy of a particular movement or motor skill.

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# CONSTRUCTION OF SPORTS BUSINESS PROFESSIONAL COMPETENCE CULTIVATION INDICATORS IN ASIAN HIGHER EDUCATION

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***ABSTRACT***

*The focus of this research was on the professional competence indicators of Asian sports business professionals. The aim of the research was to establish how scholars planned classes and programmes at the sports business related departments at colleges in Taiwan, Japan, Korea and China by making use of a questionnaire. By analysing selected literature, the first draft of a questionnaire was generated. By combining inputs from the scholars and experts from each country, the questionnaire was finalised. This was followed by a survey involving senior professors from China, Japan, Korea and Taiwan. A total of 40 academics, 10 from each country, served as the research sample The analysis revealed the following: General abilities, such as working attitude, communication, and creativity, were recognised by academia as the important abilities for sports business professionals; Professional skills and professional knowledge were valued as less important than the general abilities; There was no difference in sports business professional competence indicators among the main Asian countries.*

**Keywords:** Sports business; Sport management; Professional competence.

## INTRODUCTION

According to the report of *Agence France-Presse* at the end of 2009, Asia has had a great influence on the economy and politics worldwide in the past decade. The spotlight of the world has gradually shifted to the East and the 21st Century has become the „era of Asia". At the beginning of 2010, *Chosun Ilbo*, the largest newspaper in Korea, published a series of special reports, named „Asian Era", which revealed different perspectives of the arrival of the Asian era. One of the reports mentioned that the total amount of the foreign exchange reserves held by the first seven Asian countries had been more than the total amount held by all other 149

countries in the world. Asia was like a black hole attracting capital for investments from all over the world. Along with the arrival of the Asian era, the prosperity of sports business in Asia has turned out to be much more profitable.

At the end of 2007, *Sport Business*, a British magazine, published a report entitled "Asia: Opportunities in the business of sport", pointing out the fast growth of the sports business in Asia. The report stated that Asia would be at the centre of the development of world politics, economy, culture, and entertainment. As well as the expansion of China‟s market and economy, the Beijing 2008 Olympic Games, the Kaohsiung 2009 World Games, the Taipei

2009 Summer Deaflympics, the Guangzhou 2010 Asia Games and the World Expo 2010 in Shanghai brought Asia to be under the spotlight as the centre of the world‟s economy. In 2009, the Kaohsiung 2009 World Games brought Kaohsiung US$9.7 million as the gross profit and US$5 million (Sun, 2010) as the added value. All these facts indicate that sport is a great attraction and provides a huge market. The Chinese scholar Siao-Ming Bao (2000) believes that sport is the new economic growth point and could be a key element dominating the economic performance of each country in the future.

Following the fast growth of the sports business worldwide, many colleges established sports business and sport management related programmes and departments. They arranged classes and programmes focussed mainly on the standards of cultivating sport management professionals, as generated by the North American Society for Sport Management (NASSM) and the National Association for Sport and Physical Education (NASPE) in 1989. However, the sports business has changed substantially during the past decades and these standards of cultivating sport management professionals no longer fulfilled practical needs (Sports Business Journal, 2009). Therefore, the Commission of Sport Management Accreditation (COSMA) replaced the previous standards to provide better professional competence indicators, thereby satisfying the most recent requirements of the sports business.

Experts and scholars have different opinions about the training of sports business professionals. Although Smolianov and Shilbury (1996) and Hsu (2002) analysed the needs of professional competence based on the sports marketing requirements, a number of researchers analysed the needs based on the sports management professional abilities (Quian & Parks, 1986; Jamieson, 1987; Lambrecht, 1987; Farmer, 1988; DeSensi *et al*., 1990; Huang, 1992; Chen, 1993; Cheng, 1993; Lin & Liu, 1999; Lu & Lu, 2002). In spite of the standards set for sports business related programme development worldwide by COSMA, it was still based on sports management professional abilities.

## RESEARCH PROBLEM

The current research focused on the establishment of the competence cultivation indicators for sports business management professionals within the programmes of Asian higher education institutions. The scope of the current research included four selected Asian countries, namely China, Japan, Korea and Taiwan. The concepts of professional competence cultivation and „professional competence cultivation

indicators" are viewed within an educational perspective as pursued in higher education institutions. In order to facilitate the integration of the information collected from each country (China, Japan, Korea and Taiwan), scholars, who are currently involved with advanced development programmes in sports business, were invited to join the research team. With this collaboration, misunderstandings that may arise among the different cultures could be avoided.

## METHODOLOGY

### Participants

Four Asian countries, namely China, Japan, Korea and Taiwan, were selected for this study. A total of 11 experts, 2-3 experts from each selected country, were involved in the

preliminary interviews to help finalise the content of the questionnaire. The 11 experts were invited by the senior professors in sport business and sport management and related fields in each country.

The senior professor in each selected country invited the chairmen and the class/programme planners of 10 well-known sports business and sport management related departments in the colleges from their own country to be part of the sample for the survey; thus, totalling 40 academics across the 4 countries. After analysing the collected questionnaires, the research team invited 7 experts and scholars from academia, government and industry to form a focus group (Table 1) to have a meeting to process their view.

***TABLE 1*: EXPERTS IN FOCUS GROUP**

| Code | Professional status | Category |
|---|---|---|
| A1 | CEO of a fitness centre | Industry |
| A2 | General Manager of a marketing company | Industry |
| A3 | Senior Manager of a marketing company | Industry |
| A4 | General Manager of an international sports utility company | Industry |
| B1 | Sub-Head of a physical education department in a city | Government |
| C1 | Professor in sports business related fields | Academia |
| C2 | Chairman of a sports business related institute | Academia |

### Research methods

At the beginning of this study the research team studied selected documentation and related literature to generate the first draft of the questionnaire. The draft of the questionnaire was modified and quantified according to the comments and the suggestions from the expert interviewees of each selected country. Confirmation of the modified questionnaire was based on the responses from the interviewees to establish the content validity and rater reliability. The final questionnaire served to conduct the survey among the selected sample. Finally, the focus group was involved

by providing suggestions and interpretations of the research results.

**Measurement tools**

***Interviews***

In order to establish the validity and reliability of the questionnaire interviews were conducted. After the first draft of the questionnaire was generated from the literature, the associate host of this research in each country considered the situation on an academic and industrial level to select the experts and senior scholars in the country to be the interviewees. The draft of the questionnaire was modified and quantified according to the comments and the suggestions from the interviewees.

***Questionnaire***

Integrating the references related to the professional competence indicators (Hsu, 2002; Williams, 2003; Kuo, 2004; Lin, 2010; Zhou & Hu, 2010) and reviewing the suggestions and the ideas from the experts at „Asia Taipei International Sport Industry Forum 2009" and adding a „creativity" dimension, 6 dimensions were constructed for a closed-ended styled questionnaire. The 6 dimensions were: professional knowledge, professional skills, communication, administration, work-related attitude and creativity. These 6 dimensions formed the framework of the questionnaire. The questionnaire consisted of a total of 44 questions categorised and spread across the 6 dimensions. A 5-point Lickert scale was used for the responses to the questions. Based on their personal experience and recognition, the participants of the survey responded to the statements by selecting 1 of the 5 options ranging from 1 (strongly disagree) to 5 (strongly agree) for each.

**Research procedures**

The available literature on sports business professional competence cultivation indicators was located and analysed. After a thorough analysis and collation of the information available, it was possible to generate the first draft of the questionnaire. This draft was translated into an English version, and it was sent to the associate hosts of each selected country. The latter were responsible to translate this version into Japanese, Korean and simplified Chinese, including the Traditional Chinese which had to accommodate four different language dialects. The experts were interviewed about the draft questionnaire and suggestions were incorporated when modifying the questionnaire and finalising the quantification. This modified version went back to the interviewees to confirm its content validity and followed by establishing the rater reliability.

The 10 experts from well-known sports business and sport management related departments in the colleges in each country were selected by the associate host of that country. Invitations letters and the questionnaires were sent via e-mail to the chairmen and the class/programme planners of the selected departments in the colleges in each country. The completed questionnaires were returned within a 10-day period.

**Statistical analysis of data**

Using the literature analysis method, researchers studied the current sports industry development situation and the sports business related classes/programmes in colleges in the main Asian countries (China, Japan, Korea and Taiwan). Through the establishment of Endnote Library researchers collected the most complete documents and lectures about sports business for the basis of our analysis. Researchers later interviewed the experts to gather their suggestions and opinions. By using Nvivo8, qualitative research software, the data collected in both oral and written formats were analysed and the related matrix was constructed. From the matrix researchers built up the content validity of the Asian Sports Business Professional Competence Indicators. The final official version of *The questionnaire of Asian Sports Business Professional Competence Indicators* was generated through the integration of the documents, the review of the experts‟ suggestions and the revision of the draft.

Hair *et al*. (1998) stated that the range of Cronbach‟s Alpha value should be between 0 and 1.

In general studies, *α-values* are supposed to be more than 0.7. The minimum eligible limit would be 0.6. In this research, through Cronbach‟s Alpha value test, it was found that the reliability of each dimension was between 0.65 and 0.86 and that the reliability of the main scale was 0.92. All these coefficients were more than 0.6, which means they were above the suggested eligible limit.

Statistics used for calculating the results of the questionnaire and for comparing the results of the countries were as follows. The mean and standard deviation (SD) were computed to rank the main indicator dimensions and the features of Asian sports business professional competence cultivation indicators. Pearson's correlation was applied to calculate the related analysis of professional competence dimensions. By using the one-way multivariate analysis of variance (MANOVA) a comparison was made to compare the Asian sports business professional competence cultivation indicators among the selected countries.

## RESULTS

This research surveyed the scholars planning classes and programmes at sports business related departments at colleges in China, Japan, Korea and Taiwan. From the 10 departments in each country, a total of 40 completed questionnaires were collected, processed and analysed. The results are to follow.

### Ranking of the main indicator dimensions

As seen in Table 2, the scholars in the main Asian countries (China, Japan, Korea and Taiwan) ranked the main indicator dimensions of sports business professional competence (from the most to the least important) as working attitude, communication ability, creativity, administration ability, professional knowledge and professional skills. The mean scores ranged from 3.69 to 4.44 indicating that there was agreement that all dimensions have good relevance. The standard deviations ranging from 0.45 to 0.52 were fairly similar for each dimension.

***TABLE 2*: RANKS OF MAIN INDICATOR DIMENSIONS OF ASIAN SBPC CULTIVATION**

| Dimensions | Rank | Mean | SD |
|---|---|---|---|
| Working attitude | 1 | 4.44 | 0.45 |
| Communication | 2 | 4.32 | 0.51 |
| Creativity | 3 | 4.30 | 0.45 |
| Administration | 4 | 4.19 | 0.49 |
| Professional knowledge | 5 | 4.02 | 0.52 |
| Professional skills | 6 | 3.69 | 0.52 |

SD= Standard Deviation

**Related analysis of professional competence dimensions**

Concerning the 6 dimensions of Asian sports business professional competence indicators, each pair of dimensions had a coefficient between 0.25 and 0.80 (Table 3). Most of them were moderately correlated, yet all but 1 correlation was significant ($p<0.05$). It shows that the variances had no significant co-linearity or unrelated variables. Further analysis could be processed.

***TABLE 3*: PRODUCT-MOMENT CORRELATION COEFFICIENT ANALYSIS OF ASIAN SBPC INDICATOR DIMENSIONS**

| Dimensions | 1 | 2 | 3 | 4 | 5 | 6 |
|---|---|---|---|---|---|---|
| 1. Professional knowledge | — | | | | | |
| 2. Professional skills | 0.68* | — | | | | |
| 3. Communication | 0.70* | 0.45* | — | | | |
| 4. Administration | 0.71* | 0.44* | 0.80* | — | | |
| 5. Working attitude | 0.62* | 0.48* | 0.57* | 0.60* | — | |
| 6. Creativity | 0.66* | 0.25 | 0.62* | 0.67* | 0.50* | — |
| Mean | 4.02 | 3.69 | 4.32 | 4.19 | 4.44 | 4.30 |
| Standard Deviation | 0.52 | 0.52 | 0.51 | 0.49 | 0.45 | 0.45 |

* $p<0.05$

**Comparison of Asian SBPC Cultivation Indicators**

By means of a one-way multivariate analysis of variance (MANOVA), differences in the importance of the required sports business professional competence indicators recognised by the managers at higher educational institutions in the four Asian countries were investigated.

***TABLE 4*: MULTIVARIATE ANALYSIS OF VARIANCE OF ASIAN SPORTS BUSINESS PROFESSIONAL ABILITIES**

| Source of variation | df | SSCP | | | | | | Λ |
|---|---|---|---|---|---|---|---|---|
| Interclass | 3 | 0.494 | 0.289 | 0.745 | 0.640 | 0.268 | 0.490 | 0.667 |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 0.289 | 0.430 | 0.327 | 0.184 | 0.115 | 0.115 | n.s. |
| | | 0.745 | 0.327 | 1.176 | 1.089 | 0.377 | 0.837 | |
| | | 0.640 | 0.184 | 1.089 | 1.223 | 0.129 | 0.904 | |
| | | 0.268 | 0.115 | 0.377 | 0.129 | 0.394 | 0.154 | |
| | | 0.490 | 0.115 | 0.837 | 0.904 | 0.154 | 0.681 | |
| Intraclass | 36 | 10.152 | 6.953 | 6.554 | 6.391 | 5.467 | 5.524 | |
| | | 6.953 | 10.110 | 4.293 | 4.143 | 4.285 | 2.113 | |
| | | 6.554 | 4.293 | 9.048 | 6.638 | 4.754 | 4.685 | |
| | | 6.391 | 4.143 | 6.638 | 8.008 | 5.025 | 4.796 | |
| | | 5.467 | 4.285 | 4.754 | 5.025 | 7.577 | 3.778 | |
| | | 5.524 | 2.113 | 4.685 | 4.796 | 3.778 | 7.167 | |

df= Degrees of freedom; n.s.= No significance p>0.05; SSCP= Sports business professional competence

The results from the homogeneity test for the MANOVA covariance matrix were as follows. Transferring Box‟s M=107.679 to be F-ratio, 1.171 was found. The p-value from the significance test was 0.170 which is greater than 0.05 and thus does not reach the level of significance. The null hypothesis for the data structure did not violate the assumption of the variance/covariance matrix in homogeneity, and the correctness of the analysis was ensured. From Table 4 Wilks Λ=0.667 (p=0.748>0.05) has not reached the level of significance (0.05). The mean vector of each country (China, Japan, Korea and Taiwan) has no significant difference. It can therefore be concluded that the main Asian countries have no significant difference in the 6 dimensions of sports business professional competence.

**Rankings of features of dimension of Asian SBPC cultivation indicators**

Six dimensions were constructed for the SBPC and, based on the integration of the lectures and all relevant documentation; it was possible to generate the features for each dimension. The associate hosts in each country helped to verify the content of the dimensions. The rankings of the features within each dimension were as follows.

***Professional knowledge***

Among the features of the *professional knowledge* dimension, „sport marketing knowledge‟ (M=4.22, SD=0.95) was ranked as the most important feature, while „sport management knowledge‟ (M=4.15, SD=0.92) and „understanding of the benefits of every sport‟ (M=4.15, SD=0.66) awere ranked second and third.

***TABLE 5*: RANK OF FEATURES OF PROFESSIONAL KNOWLEDGE DIMENSION**

| **Features** | **Rank** | **Mean** | **SD** |
|---|---|---|---|
| Sport marketing knowledge | 1 | 4.22 | 0.95 |
| Sport management knowledge | 2 | 4.15 | 0.92 |
| Understanding of benefits of every sport * | 3 | 4.15 | 0.66 |
| Ability to analyse the fashion | 4 | 4.03 | 0.73 |
| Ability to appreciate sports ** | 5 | 4.00 | 0.78 |

| | | | |
|---|---|---|---|
| Knowledge of regulations related to sports business | 6 | 4.00 | 0.75 |
| Knowledge of sports business financial management | 7 | 3.83 | 0.71 |
| Recognition of a crisis and ability to resolve problems | 8 | 3.75 | 0.81 |

SD= Standard Deviation * Includes watching and participating in sports
** Understanding uniqueness of each sports related product

***Professional skills***

Among the features of the Professional Skills dimension, „ability to analyse sports business" (M=4.37, SD=0.81) was ranked as the most important feature. „Ability to set up the contracts" (M=3.90, SD=0.87) and „ability to use computers" (M=3.90, SD=0.71) were ranked at second and third. Interestingly, the lowest ranked item was „experience as an athlete".

***TABLE 6*: RANK OF FEATURES OF PROFESSIONAL SKILLS DIMENSION**

| **Features** | **Rank** | **Mean** | **SD** |
|---|---|---|---|
| Ability to analyse sports business | 1 | 4.37 | 0.81 |
| Ability to set up contracts | 2 | 3.90 | 0.87 |
| Ability to use computers | 3 | 3.90 | 0.71 |
| Practical skills at operating sports business | 4 | 3.70 | 1.09 |
| Experience at sports | 5 | 3.43 | 0.87 |
| Ability to coach sports | 6 | 3.40 | 0.87 |
| Experience as an athlete | 7 | 3.10 | 0.81 |

SD= Standard Deviation

***Communication***

Among the features of the Communication dimension, „good relationship with the customers" (M=4.45, SD=0.60) was ranked as the most important feature. „Ability to handle customer complaints" (M=4.38, SD=0.63) and „ability to coordinate" (M=4.35, SD=0.66) were ranked second and third. Within this dimension of administration, „language ability" was ranked last, yet the means were not far apart from one another and still it has a noteworthy mean.

***TABLE 7*: RANK OF FEATURES OF COMMUNICATION DIMENSION**

| **Feature** | **Rank** | **Mean** | **SD** |
|---|---|---|---|
| Good relationship with the customers | 1 | 4.45 | 0.60 |
| Ability to handle customer complaints | 2 | 4.38 | 0.63 |
| Ability to coordinate | 3 | 4.35 | 0.66 |
| Teamwork | 4 | 4.25 | 0.74 |

| | | | |
|---|---|---|---|
| Language ability | 5 | 4.17 | 0.71 |

SD= Standard Deviation

***Administration***

Among the features of the Administration dimension, „ability to make the correct decision" (M=4.45, SD=0.68 ) was ranked as the most important feature. „Ability to handle the emergent issues" (M=4.45, SD=0.71 ) and „ability at planning and execution" (M=4.33, SD=0.73) were ranked second and third. The items „Ability to set up the budgets" and "Ability to analyse financial reports" both had low rankings and both had to do with finances. The lowest ranked "Ability at exploring human resources" was a challenging feature as it would require a sensitivity regarding human relations and handling conflict situations.

***TABLE 8*: RANK OF FEATURES OF ADMINISTRATION DIMENSION**

| Feature | Rank | Mean | SD |
|---|---|---|---|
| Ability to make correct decisions | 1 | 4.45 | 0.68 |
| Ability to handle emergent issues | 2 | 4.45 | 0.71 |
| Ability at planning and execution | 3 | 4.33 | 0.73 |
| Ability to promote products or services | 4 | 4.28 | 0.64 |
| Leadership | 5 | 4.23 | 0.62 |
| Ability to analyse customers" requirements | 6 | 4.22 | 0.70 |
| Ability to set up the budgets | 7 | 4.00 | 0.64 |
| Ability to analyse financial reports | 8 | 3.90 | 0.71 |
| Ability at exploring human resources | 9 | 3.90 | 0.74 |

SD= Standard Deviation

***Working attitude***

Among the features of the Working Attitude dimension, „being responsible" (M=4.70, SD=0.56) was ranked as the most important feature. „Passion at work" (M=4.65, SD=0.53) and „personalities and morals" (M=4.63, SD=0.59) were ranked second and third. Each feature had a mean above 4.0 which is high. In spite of the rankings, this could suggest that each feature was nearly equally important.

***TABLE 9*: RANK OF FEATURES OF WORKING ATTITUDE DIMENSION**

| Feature | Rank | Mean | SD |
|---|---|---|---|
| Being responsible | 1 | 4.70 | 0.56 |
| Passion for work | 2 | 4.65 | 0.53 |
| Personalities and morals | 3 | 4.63 | 0.59 |

| | | | |
|---|---|---|---|
| Complete work thoroughly | 4 | 4.38 | 0.67 |
| Good concepts of service | 5 | 4.38 | 0.67 |
| Passion for sports | 6 | 4.35 | 0.77 |
| Willingness to serve | 7 | 4.30 | 0.65 |
| Positive behaviours during learning | 8 | 4.27 | 0.68 |
| Time management | 9 | 4.27 | 0.68 |

SD= Standard Deviation

***Creativity***

Among the features of the Creativity dimension, „willingness to take the challenge of new things" (M=4.55, SD=0.55) was ranked as the most important feature. „Creativity" (M=4.53, SD=0.68) and „good observation" (M=4.37, SD=0.67) were ranked second and third. Once again each feature had a mean above 4.0 and the lowest and the highest mean only differed by
0.50. This could suggest that each feature was of equal importance.

***TABLE 10*: RANK OF FEATURES OF CREATIVITY DIMENSION**

| **Feature** | **Rank** | **Mean** | **SD** |
|---|---|---|---|
| Willingness to take challenge of new things | 1 | 4.55 | 0.55 |
| Creativity | 2 | 4.53 | 0.68 |
| Good observation | 3 | 4.37 | 0.67 |
| Clear thinking | 4 | 4.23 | 0.70 |
| Curiosity | 5 | 4.10 | 0.63 |
| Ability at reasoning and logic | 6 | 4.05 | 0.55 |

SD= Standard Deviation

**DISCUSSION**

In Asian Higher Education Perspective, „Working Attitude", „Communication" and „Creativity" are considered as the most important abilities at sports business professional competence cultivation indicators. When comparing the ranking of professional competence indicators in each country with the ranking of professional competence indicators in the whole of Asia, it is clear that the first three items had a minor difference (Table 11).

***TABLE 11*: RANKINGS OF PROFESSIONAL COMPETENCE INDICATORS FOR ASIA AND ITS FOUR COUNTRIES**

| **Dimension** | **Asia** Rank (mean) | **China** Rank (mean) | **Japan** Rank (mean) | **Korea** Rank (mean) | **Taiwan** Rank (mean) |
|---|---|---|---|---|---|

| | | | | | |
|---|---|---|---|---|---|
| Working attitude | 1 (4.33) | 3 (4.43) | 1 (4.41) | 1 (4.31) | 1 (4.59) |
| Communication | 2 (4.33) | 1 (4.54) | 3 (4.32) | 3 (4.06) | 2 (4.36) |
| Creativity | 3 (4.33) | 2 (4.47) | 2 (4.37) | 2 (4.12) | 3 (4.27) |
| Administration | 4 (4.33) | 4 (4.43) | 4 (4.27) | 4 (3.97) | 4 (4.11) |
| Professional knowl. | 5 (4.33) | 5 (4.16) | 5 (3.98) | 5 (3.86) | 5 (4.06) |
| Professional skills | 6 (4.33) | 6 (3.81) | 6 (3.53) | 6 (3.67) | 6 (3.72) |

Knowl.= Knowledge

The main countries in Asia generally value „working attitude" as a very important feature. The professionals in Japan, Korea and Taiwan, all ranked „working attitude" highly, whereas the professionals in China ranked „communication ability" higher than „working attitude"; this is probably because sports business development in China is still in the early stages of development. When comparing this finding with those from earlier research carried out on sports business, significant differences were found. In order to have a benchmark for comparing the recent results with those from earlier research, the abilities and the features were categorised for the comparisons. In the study by Quilan and Park (1986), sports promotion, sports marketing and sport management were found to be the three categories with the highest relevancy to sport management. However, any further comparison with the research of Quilan and Park (1986) was not possible because only eight abilities within six categories of sport management related jobs were included and there was no detailed description of the professional abilities.

Jamieson (1987) stated that the five most important professional abilities for the middle-level sports business staff were in the fields of administration ability, community ability and professional skills. Farmer (1988) studied the members of the sport management associations in Australia and found the five abilities relating to administration ability were ranked in the top 10 of the sport management professional abilities. DeSensi *et al*. (1990) studied 14 categories of managers. For the managers at fitness centres, communication ability and administration ability were the most important. For the managers in professional sports administration, excluding communication ability and administration ability, the professional skills, such as computer skills and sports skills, were also important. Smolianov and Shilbury (1996) studied sports marketing related professional abilities for sports marketing staff and found seven administration related abilities were ranked within the top 10 of the professional abilities. Two abilities relating to professional skills and two relating to communication were also ranked within the top 10 important abilities. The studies considered above were all conducted at least 10 years prior to the current study that produced different results. Smolianov and Shilbury (1996) pointed out the differences between their research and previous research, as caused by the gap in time; this was because their study had significant differences to Bretting"s study of 1983. This suggests that similar research should be conducted at least once within 5 to 10 years.

Comparing the results of this research to those of earlier studies, it was found that communication ability is also ranked highly but administration ability has been replaced by working attitude and creativity, and traditional knowledge has been

replaced by practical working ability. These facts match the tendency of the developments in the modern sports industry and the current situations. These facts are in agreement with H. Pinnington"s extended statement of KSAs theory (Knowledge, Skills, and Abilities), in which professional abilities, such as skills, attitudes and personal characteristics, should also be valued highly, as well as the factors concerning knowledge (Jorgen & Ashly, 2009). The attitude and personalities related to working attitude are covered in the current research as well.

When comparing the results from this study to the current situation in academia and industry, and after integrating and analysing the questionnaires, a forum was set up to seek the opinions and suggestions from the industry. Experts from industry reviewed the results of our study and then shared their comments. They believed that working attitude was ranked first of

the six dimensions because the requirements of professional abilities have changed due to the fast growth of the industry. Regarding communication ability, administration ability and working attitude, the experts suggested that the schools should have students learning from practical experience and participation, instead of through theoretical lectures.

Below are some comments from the interviewees. The number in brackets, which follow the section, is the code of experts listed in Table 1.

> *Working Attitude is the fundamental of each job position, no matter if the job is related to sports business.* (B1)

> *In the dimensions of communication, administration, and attitude, every kind of feature should be connected to the practical works. The educators should cultivate the students from the basic part of the real works, not from the lectures. In this way, the teachers and educators can find the potential talented students for sports business.* (A3)

> *Different fields have different requirements at a human resource level. Academia focuses on the people with professional knowledge. Industry focuses on the people with creativity. We should educate the students with the professional knowledge from the fundamental part, and have their knowledge combined with the learning from the real works. In this way, the students can have a better understanding of the learning, and will apply it to the works in a better manner.* (B1)

Creativity as a professional ability is seldom mentioned in research. Only Lin and Liu (1999) and Hsu (2002) mentioned professional abilities related to creativity and a few creative concepts. They also thought the creativity mentioned should provide effective help in real business.

> *To industry, whether the creativity from an individual could bring the business a new chance, a new idea, and a new scope is more important.* (B1)

Higher education should not only concentrate on teaching students the professional skills and the professional knowledge to enable them to obtain the professional certificates. The educators should also provide more training on practical experience

and pay attention to cultivating the so-called soft powers, such as working attitude, communication and creativity.

**SBPC cultivation indicators as viewed by higher education institutions in the main Asian countries**

A further comparison was made on how people in the various higher education institutions in the selected Asian countries perceive sports business professional competence cultivation. No significant differences were found. Beside the fact that the potential errors of the research were limited to the minimum, the questionnaire was also reviewed by other affiliated senior professors in each country. Therefore, it can be concluded that there is no significant difference in the way in which academics from the four Asian countries consider sports business professional competence cultivation. This point could form the grounding base for similar large-scale research in the future.

**Content analysis of Asian SBPC cultivation indicators**

„Sports marketing related knowledge" is viewed as an important part of the knowledge dimension. At the meeting of the focus group the experts commented as follows:

> *In the sports marketing related fields, the largest problem is that we seldom get the chance to find a professional with the abilities at both sports and marketing. Those who have a passion for sports but have no financial management knowledge would lack the knowledge to operate the business. Those who have the sports related knowledge but have no passion would not last long in this field and might not have an outstanding performance at work.* (A4)

When discussing the „knowledge of the sports business related regulations", some scholars thought that the involved regulations should not only cover the ones related to the sports business. This is because many regulations could be applied to several kinds of business and it should therefore view this ability in a general context. This would be an interesting enquiry topic for further study.

> *In the dimension of 'professional knowledge' the knowledge of regulations is very important. For example, 'Personal Information Protection Regulation' covers a lot of works and activities, such as the announcement of the sweepstake winner's name, and the publication of the brochures with individual information. To cover the sports business from all the directions we should not only look at the sports business related regulations but also at all the business related regulations.* (A3)

The dimension of professional skills is ranked in the last place when it comes to Asian sports business professional competence indicators. However, within this dimension, „ability to analyse sports business" has scored far higher than other features. Obviously, this ability is valued as a very important one by the class/programme planners in colleges. „Experience as an athlete" is ranked as the lowest within this dimension. The rankings of „experience of sports" and „ability to coach sports" are both higher than „experience as an athlete", which means „experience as an athlete" is not that important in the sports business. Whoever has

experience of sports and is able to coach sports seems to be good enough.

When analysing communication ability, the professionals from within academia valued the abilities to interact with the customers and to handle their complaints higher than the abilities to coordinate and to cooperate with the team. Many earlier studies revealed the importance of the ability to communicate with the customers and to handle their complaints. Jamieson (1987) stressed the importance of communication with customers. Lambrecht (1987) also mentioned the importance of communicating with customers and handling their complaints. Farmer (1988) and DeSensi *et al*. (1990) all referred to the importance of communication. Regarding the ability to communicate, the comments from the scholars and the experts were expressed as follows:

> *For the concern of the human resource requirement in business management related departments, communication ability and creativity are more helpful at accomplishing works, although professional skills and professional knowledge are also important.* (B1)

> *How people perceive sports business professional competence cultivation indicator in each country is very similar. When interviewing the professionals in sports business from each country, we found the results were pretty much the same. It shows that the goal of college education is not only to enable the students to get the professional certificates, but also to enable the students to have soft powers, such as a good working attitude, communication ability, and creativity.* (C2)

Concerning the dimensions of „administration ability" and „ability to make the correct decision", they were valued as the most important abilities. Most experts and scholars thought that the ability to make decisions involved the ability to integrate information, analyse the conditions and select the optimal options. It is thus viewed as the integration of many kinds of abilities. In any further research, the detailed parts should be separated from this topic and investigated more thoroughly.

> *As to the ability to make the decisions, the ability to make the correct decisions should not be viewed as a single feature because the correctness of a decision is the result of a series of the correct works. Therefore, I would take the ability to make the decisions out from the dimension. I think making a right decision is a consequence …* (A2)

The professionals did not consider it right that the „ability to analyse financial reports" ranked in the second to last place. They thought financial report analysis was very important in a real business setting. However, the importance of this ability depends on the job position.

> *… later on, I care more about the financial reports because many businesses are bankrupted for financial issues. I feel financial ability is very important.* (A1)

> *The ranking of professional competence could be matched to the requirements of the job positions. For the middle and high-level professionals, professional skills may be not that important. However, for the first-tiered customer support staff at fitness centres,*

> *professional skills may be very important…* (A3)

The gap in the opinions on financial report analysis could be caused by the difference in perceptions of roles, depending on the interviewees. Some of the interviewees were lower-level staff, whereas some were middle-level managers. In a more precise investigation in the future, the questionnaire needs to be revised by providing clearer definitions of the components.

In the dimension of „working attitude", academia valued the cultivation of taking responsibilities and character education highly, and chose „passion at work" as the key element in human resource cultivation. In the results of the study, „passion at sports" was ranked lower than „passion at work". In the dimension of „professional skills", „experience of sports" and „experience as an athlete" were ranked low. This complements the results of the observation in the sports business referred to before.

> *In particular, the current sports business professionals might not have a passion for sports. However, the passion for work and being responsible would definitely impact the ways that the managers look at the staff.* (B1)

In the dimension of „creativity", „willingness to take the challenge of new things" is always encouraged, especially in academia. However, the feature of „creativity" and the dimension of „creativity" share the same word. This might have confused the participants. This needs to be rectified by revising the feature of „creativity" as „creativity in multiple fields" for any future research. In this dimension, „curiosity" and „ability at reasoning and logic" are ranked in the last two places. The professionals from industry did not agree with this result.

> *'Creativity' and 'ability at reasoning and logic' are important. This kind of logic and reasoning ability is not just an ability for systematic logic but also 'the ability to learn, understand and use the new skills and the concepts'. The ability indicator should present this concept further, so that it could demonstrate the potential of the personal creativity more precisely.* (A3)

> *As I said before about the ability of logic and reasoning, academic experts had different points of view from us in industry. From my personal experience, when interviewing a new job candidate I do not really mean to know what the candidate wants for his or her salary and benefits but how he or she responds to my questions. So, in the interviews, I try to ask the questions from different directions, such as about professional abilities, financial concepts, or sociological points. I do not mean to get the correct answers but to let the candidate think and realise. So, I think the professionals in academia should understand what we think in industry about logic and reasoning ability. The ability of logic and reasoning was ranked in last place, which is totally out of my expectation. I think the ability of logic and reasoning is very important.* (A2)

## CONCLUSIONS

Within the sports business professional cultivation indicators, „working attitude", „communication", and „creativity" are generally valued highly within the academia circle. Within the six dimensions of sports business professional abilities, „working attitude" is valued as the most important one. In this dimension, „being responsible", „passion at work", and „character education" are most important features. „Communication ability" centres on the communication with customers. In the dimension of „creativity", besides encouraging the willingness to take challenge, the opportunity to practise it within a work situation should be given more attention.

The importance of professional skills and professional knowledge was of less importance than the other general abilities. Professional skills and professional knowledge were ranked low, which could mean that the professionals in industry do not consider having the professional abilities or talents. Compared with the other general abilities, sports ability was also ranked low.

There were no significant differences in how the academia in the four Asian countries viewed the sports business professional competence indicators which was based on comparisons of the averages of the importance of the indicators. This fact implies that most professionals in each country supported the sports business professional competence indicators identified in this research.

## RECOMMENDATIONS

Based on the findings of this research, further research is needed to revise the questionnaire and the process should be based on involving a larger sample in Asia. The sample of this research only covered four countries and 40 participants. The validation of the results could be low. A larger sample of countries and participants could be a better resource for reference and provide acceptable validation.

A confirmatory analysis of the relevance of professional competence indicator titles and the content and meanings of the dimensions confirm their relevance. For example, in this research, although the dimension of professional skills included sports-oriented skills, such as
„practical skills at operating sports business", „ability to coach at sports", „experience at sports" and „experience as an athlete", other more general abilities, such as the ability to analyse sports business, the ability to set up the contracts and the ability to use computers, could also be included. Furthermore, future research could study the relationship between the gross output value of each country"s sports businesses and their ranking based on the contents of the professional competence indicators.

This research was planned to be completed within a year. Due to limited time, the data and information collected about the gross output value for each country could not be analysed more thoroughly, which would have assisted with the interpretation of the results. Therefore, in a further study based on the situation of the sports industry in each country, the sports industry output value can be calculated and validated. Additionally, through the comparison and analysis of the professional competence indicators of each country"s sports industry"s output value, the relationship between the sports business output value and professional competence indicators could be revealed. This could be a new avenue to be explored in.

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# RESIDENT REACTIONS TO STAGING TOUR DE TAIWAN 2012: COMPARISON OF PRE- AND POST-EVENT

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***ABSTRACT***

*This is the first study of the Tour de Taiwan (TDT) cycling race, which aims to identify and compare host resident perceptions of the impact of staging the TDT (both before and after the event). Data were collected from the host communities at three different stages of the race, located close to either the start or the finish line. For both pre- and post-test questionnaires, 482 out of 964 were obtained for analysis. An impact scale, which comprised of 22 items, was developed based on four factors: general perceptions, community coherence and development, image enhancement and tourism benefits and disadvantages. Host residents differed significantly in the perceptions of event impacts based on different geographical areas. The results also showed a significant change in resident perceptions over time [F*

*(4, 235)= 3.69, p<0.01)]. The findings suggest that overall most residents were in favour of hosting the 2012 TDT. However, the planning stage did not adequately address direct daily concerns of the residents, such as the need for community development and specific economic benefits. Future studies and event organizers should consider the congruence between the image of the event and the image of the destination.*

**Key words**: Tour de Taiwan; Major sport events; Cycling race; Resident perceptions.

## INTRODUCTION

The Tour de Taiwan (TDT) is a professional bicycle-racing event of the *Union Cycliste Internationale* (UCI) Asia Tour. Giant Sports Foundation founder King Liu established the event in 1978. The first race began in Taipei and traversed through Western Taiwan, Southern Taiwan, and Eastern Taiwan, and finally ended in Taipei. This cycling tour championship was recognised by the UCI in 2005 and was classed 2.1 for the first time in 2012. The Taiwan External Trade Development Council (TAITRA) has since teamed up with the Chinese Taipei Cycling Association (CTCA) to jointly organise the TDT, which coincides with the Taipei International Cycle Show (Taipei CYCLE). TAITRA has organised Taipei CYCLE for 25 years and has developed it into Asia‟s largest bicycle exhibition and the world‟s top three cycle trade events. The event hit a record size in 2012, hosting 1,092 companies (an increase of 15% compared to 2011) and 3,288 booths (an increase of 7.5% compared to 2011)
(TAITRA, 2012).

The 2012 TDT took place from 10 to 16 March. The race comprised of seven separate stages and covered approximately 870km of closed public roads. It involved 19 teams and more than 95 riders from 22 countries. The route began in Taipei City and ran through New Taipei City, Taoyuan County, Taichung City, Changhua County, and Tainan City to Kaohsiung City. Each stage was one day in duration, and began and ended in the same host city. More than 182 people were involved in organising the 2012 event in addition to over 1,145 volunteers, comprised of undergraduates and local residents. In order to highlight Taiwan as a tourist destination, two professional sports television channels, ESPN and Eurosport, were paid to broadcast the TDT. The event was broadcast for 30 minutes each day on ESPN reaching 24 Asian countries (approximately 170 million households) and 10 minutes each day on Eurosport reaching 47 European countries (approximately 50 million households). In Taiwan alone, a wide variety of media, including TV, newspapers, magazines and the Internet reached an audience of more than 4 470 000 people. Its value was equivalent to approximately USD$2.1 million. An estimated 43 362 people watched the cyclists along the course of seven stages, and an edited version of the event was developed for DVD (2 hours and 13 minutes in duration). In total, it cost approximately USD$2.7 million to host the 2012 TDT.

In contrast to many other major sporting events (Olympic Games or World Cups), cycling races such as the Tour de France (TDF) do not leave any tangible structures. Nonetheless, there is fierce competition amongst countries in Europe (England,

Belgium, Italy, and Spain) to host various stages of the TDF (Bull & Lovell, 2007). Like with many other sporting events, the primary function of hosting cycling races is to encourage people to take up exercise in the host destinations, followed by tourism or advertising benefits (Smith, 2009). The TDF is now the largest annual sporting event in the world and the most popular (free) spectator event (Smith, 2009; Berridge, 2012). One of the main income sources is derived through contributions from local councils wishing to host either the start or the end of the race. Consequently, it is clear that the parallel functionality of hosting cycling races is the main motivation for cities to bid for a stage.

The power of major sporting events to deliver significant change to host cities has been widely acknowledged over the last 30 years. Indeed, the staging of major sporting events is increasingly recognised as one of the development strategies available to cities, regions, or even countries. This phenomenon highlights, "the generally held belief within policy-making circles that hosting such special or hallmark sporting events is hugely beneficial" (Roche, 2001, in Bull & Lovell, 2007:230). Governments usually play a big part in financing such events, and justify the expenditure of tax revenue in annual reports of economic impact. A similar trend is discernible in local government and central government in Taiwan. Examples include events such as the 2005 performance assessment of mega events or festivals (Tourism Bureau, 2005), the 2009 Dragon Boat Festival (Kaohsiung City Government, 2009), and the 2010 Kaohsiung Lantern Festival (Kaohsiung City Government, 2010), to name but a few.

Furthermore, in recent years, the event strategy, such as hosting sporting events, has been regarded by the Taiwan government as a rapid means of promoting tourism and therefore benefiting the local economy. For example, in 2004 the Tourism Bureau developed a flagship project targeting sporting events (Fang, 2007). This included the Taipei International Dragon Boat Competition, the International Siouguluan River White-Water Rafting Race, the TDT

Cycling Race, the World Cup Marathon, the Taroko Gorge Marathon, the Yi-Lan International Collegiate Invitational Regatta, the 10 000 People Sun-Moon Lake Traverse, the Taiwan International Kite Festival and the Double-Handed Dinghy Open-49er. Given the increasing reliance of many cities on hosting major events to catalyse redevelopment and branding, the need to establish effective strategies to evaluate community impacts has become urgent (Ma *et al*., 2006).

It has also been noted that event planners and stakeholders use the views of the community to gauge the success and sustainability of their investment (Williams & Lawson, 2001). For example, the organisers of the London 2012 Olympic Games paid extra attention to strategies, which generated sustainable benefits over the long-term for host communities. In Taiwan, the reports published by both central and local government authorities about the performance assessment of festivals or events have found that most focus on issues such as service satisfaction (transportation, accommodation, food, facility, hotel, etc.), attractions (attendance, willingness to come back, etc.) and economic impact (visitor spending at the events). The participants in almost all of the surveys were visitors. Therefore, the opinions of the host communities have not been carefully considered. In this regard, a better

understanding of the comprehensive impacts of major events (sporting events) on host communities will help develop effective event strategies based on constructive partnerships between participants, event planners and visitors.

## RESEARCH PROBLEM

Against this background, the purpose of this study was to investigate the perceptions of the host residents of the impact of staging the TDT (both before and after the event). It is important to examine residents‟ perceptions before and after the event because it offers a better picture of the dynamics of event development. The results obtained prior to the event can help event organisers to identify concerns so that specific problems can be properly addressed and avoided. The investigation conducted after the event can be used to evaluate the success of the event. Nowadays, the TDT has become one of the most well-known scheduled cycling races in Taiwan and nearby regions. However, this major sporting event has not received any attention in relevant research.

Results from this study were expected to contribute to the development of a better understanding of the positive and negative contributions of the event. Furthermore, the results could shed light on how host communities under investigation respond to the impact of the event, which can be beneficial for the public sector and event organisers who will be able to better understand public concerns and gain support from residents through developing appropriate strategies. Such research will also provide a benchmark for future development of the event through taking into account the preferences of local communities. The findings will aid the cross-validation of investigations of various sport events in Taiwan. More importantly, the comparisons between the TDF and the TDT may also assist in the identification of patterns and trends regarding the impact of events (Ohmann *et al*., 2006).

## LITERATURE REVIEW

### Perceived impacts of sporting events

Previous studies have highlighted the economic impacts of staging events. Economic benefits are related to employment (Masterman, 2004), business leveraging (O‟Brien, 2006), providing opportunities for recreational activities (Allen *et al.*, 1993), source of income (Kang & Perdue, 1994) and tourism (Solberg & Preuss, 2007). Social impacts involve an increase in community pride (Waitt, 2003), community engagement (Shipway, 2007), sport participation (Collins *et al.*, 1999) and health promotion (Frey *et al.*, 2007). In addition, environmental projects benefit from cities hosting major events (Preuss, 2004). High profile events, for example, the Olympic Games, are likely to generate an increased interest in natural landscapes (Deccio & Baloglu, 2002).

Deccio and Baloglu (2002) found that staging mega events inflates the prices of goods and services, placing a huge burden on local residents. Consequently, this generates opposition to the events. Ritchie *et al.* (2009) noted that the mismanagement of public funds actually increases costs over time. Various studies have also found that hosting major events has a negative social impact. Cashman

(2006) noted that the interests of marginalised groups are frequently ignored. Fredline (2004) suggested that traffic congestion occurs during the construction of event venues or during the event itself. Ritchie *et al*. (2009) noted that crime increases due to an influx of visitors to the host destination. Hiller (1998) suggested that the planning of the event influences the image of the host community held by prospective visitors. Roche (1994) observed that political turmoil could occur due to a lack of community-wide participation. Apart from the economic and social impact of hosting a major event, consideration needs to be given to the adverse effects of such an event on the natural and physical environment (Gursoy & Kendall, 2006). According to Kim *et al*. (2006), these effects include changes to land use and the pollution of water areas caused by the construction of competition sites and a deterioration of natural resources.

**Impact studies of a cycling race**

Bull and Lovell (2007) investigated the view of Canterbury residents in the lead up to the 2007 TDF. The majority of residents were aware of the arrival of the event, mainly through newspapers (36.6%), TV (32.7%) and word of mouth (21.5%). Slightly over half of respondents had plans to participate in various activities associated with the TDF. The vast majority of residents believed that the staging of the event had an important economic impact and resulted in increased tourism, with socio-cultural impacts (enhancement of community spirit; increased interest in sport and health; developing cross-cultural experiences), regarded as less important. Overall, the perceptions of the residents were positive. Residents were prepared to put up with temporary negative outcomes (disruption and inconvenience) for the sake of broader community benefits (Bowdin *et al*., 2006).

Desbordes (2007) reviewed two studies on the economic impacts of the 2005 TDF. The first survey was conducted in Digne, whereas the second survey was initiated by the organiser of the TDF and focused on three host cities (Nancy, Gerardmer, and Albi). It showed that host cities benefited short-term from the spending of spectators, increased city awareness and additional tourists. The majority of traders stated they would like the TDF to return to their

city. The findings also led to the conclusion that a significant positive economic impact of the unique sporting event satisfied the host city. However, the study did not reveal the negative impacts on local residents.

Smith (2009) assessed the value of major events as promotional tools for peripheral urban areas with reference to the case of Deptford, which rescheduled an event (Made in Deptford Festival [MIDF]), to coincide with a major event that was part of the TDF. Benefiting from the TDF, Deptford gained valuable local media coverage that helped to develop its image as a day visit destination for Londoners, although wider tourism effects were not expected to attract repeat visitors from elsewhere in Europe. This case showed that any destination could benefit from an event brand if general aspects of each are treated. It is further suggested that more work is required to see how sporting events and other types of events are affiliated with promotional benefits.

Balduck *et al*. (2011) examined the changing perceptions of the impacts of hosting a

stage of the 2007 TDF in Ghent. Before the event, residents believed that the TDF was an excellent vehicle to obtain benefits relating to city marketing, cultural interest and consolidation. Subsequent to the TDF, residents perceived substantial positive cultural and image benefits with less negative impacts. In economic terms, Ghent residents did not perceive a significant increase in economic and tourism development. In predicting resident willingness to host the TDF in the future, the positive impact factor of cultural interest and consolidation, the negative impact factor of excessive spending and mobility problems, age and educational level were all significant predictors. The more residents who thought the TDF stimulated economic and tourism development, the less willing they were to support the hosting of the TDF in the following year. Younger residents were more likely to support the hosting of the TDF in the future, whereas higher educated residents were less willing to support the hosting of the TDF. Overall, the majority of residents anticipated the return of the TDF in the future.

The aforementioned studies collectively indicate that the destinations that host the TDF can benefit substantially from increased tourism, increased city awareness, development of cross- cultural experiences and an increased interest in sport and health. However, almost all of these studies were undertaken in the context of a developed society and were limited to the same event, namely the TDF. This case study of the TDT will contribute to literature about resident expectations and perceptions of the hosting of a cycling race in a different continent (Asia-Pacific), and the identification of the respective trends of the TDF and the TDT. More importantly, this is the first time that host resident reactions to the staging of a cycling race in this country will be identified and compared to previous studies.

## RESEARCH METHODS

### Questionnaire

The tool used for data collection was the tourism impact scale. The questionnaire was divided into 2 sections. Section A captured basic demographic items such as gender, age, occupation, educational attainment, and annual personal income. Section B captured event impact factors by measuring 23 items on a 5-point Likert scale, where 1 was equivalent to „strongly disagree", 3 was equivalent to „no opinion" and 5 was equivalent to „strongly agree". The

event impact statements included in this section were based on the Verified Tourism Impact Attitude Scale (VTIAS) developed by Ma *et al*. (2011), as well as a number of sources in event tourism literature (Ritchie, 1984; Getz, 1991; Hall, 1992; Lankford & Howard, 1994; Shultis *et al.*, 1996; Twynam & Johnston, 2004). More importantly, to improve the validity of the questionnaires in the pre- and post-event surveys, the questions of the 2 time periods were integrated into the same copy of questionnaires.

### Sampling method and survey

Data were collected over 1 week (10-18 March 2012) from the host communities of 3 selected areas, Taipei City, Changhua County and Kaohsiung City, which were close

to either the start or the finish lines of the TDT. Two factors were considered important to obtaining a representative sample. On the one hand, the selected three stages were in the north, central and south of Taiwan, which constituted a good geographical coverage. On the other hand, some host communities close to the start or finish lines were in rural areas with under- represented populations, which may lead to skewed data. To minimise any sampling errors and to reduce potential bias to an acceptable level, various influential factors, such as timing (weekdays vs. weekends, office hours vs. non-office hours), exact locations (precise streets and blocks) and weather, were carefully considered. For example, to account for fewer people being available at home on weekdays rather than on weekends, weather restrictions, and limited access to some houses, and site visits to survey locations were scheduled to help reduce these problems. This sampling plan was designed with a specific purpose: to reflect the characteristics of the residents and their proximity to the host areas (Denscombe, 2003). More importantly, we conducted a pilot study in 2011, and our experiences in this research made it possible to pursue a smaller sampling frame in more targeted households.

Three teams of trained research assistants administered the surveys. The research team included undergraduate and master‟s degree students enrolled in the leisure, sport and tourism management program from three universities in each survey site. Citizens whose residences were closest to the selected survey sites were the most likely to be contacted. All respondents were informed about the purpose of the study and they completed the questionnaire on the spot. Five hundred face-to-face questionnaires were conducted either on the date of, or after the event. Instead of conducting surveys some time prior to, and sometime after the event, the collection plan was devised to avoid the difficulties of reaching representative participants who live in over 30-story apartments in metropolitan areas such as Taipei and Kaohsiung cities.

As participants were asked to complete the questionnaire on the spot, a high return rate of valid questionnaires was obtained. Although the high return rate was partly owing to questionnaire design and the timing of the survey (on the date or after), one must bear in mind a potential shortcoming of the survey is that respondents‟ opinions are likely to be influenced by the „atmosphere‟ of the event. The researchers intended to each reach 500 respondents during the pre- and post-event periods. Ultimately, 482 useable responses of each period were obtained for the study, with a 96% response rate. However, incomplete questionnaires were removed from the MANOVA analysis. This yielded 336 and 335 valid responses (using the list-wise method) for pre- and post-event respectively, with a 69% overall valid return rate. In a population of 8 000, 381 respondents (4.7% of the population)

would be seen as representative and result in a 95% level of confidence with a ±5% sampling error (Israel, 2009). However, the data collection was based on the „household‟ unit, with one member of each household completing the questionnaire. In this case, since approximately 7 000 households were targeted in total, the number of completed questionnaires (4.7% of the total targeted households) (n=336, pre-event; n=335, post-event) was adequate.

**Statistical analysis of data**

A series of statistical techniques were used, including an exploratory factor analysis (EFA) (construct validity) and a reliability analysis (Cronbach‟s alpha coefficient), to test and refine the VTIAS. Statistical procedures were conducted with data obtained prior to the event. The exploratory factor analysis technique was applied to test the „construct validity‟ of the scale. The function of this technique is to reduce or summarise a set of data by using a smaller set of factors or components (Pallant, 2001). Principal component analysis with varimax rotation was used to extract the impact dimensions. The Kaiser-Meyer-Olkin (KMO) index (should equal to or above 0.6) was adopted to assess the factor-ability of the data (Tabachnick & Fidell, 2007). Factors with an eigenvalue greater than 1 were retained for interpretation. Items with communalities and factor loadings higher than 0.40, were retained and finalised in the factor.

Cronbach‟s alpha was used to measure the internal consistency of the items that make up the scale. Following the EFA, confirmatory factor analysis using LISREL 8.72 was employed to test the adequacy of the measurement tool (post-event data). Several model goodness-of-fit indices were selected to evaluate the models, including $\chi^2$, Root Mean Square Error of Approximation (RMSEA) (less than 0.08), Comparative Fit Index (CFI) (greater than 0.95), and Normed Fit Index (NFI) (greater than 0.95) (Hu & Bentler, 1999). Chi-square is non- significant and shows that the model fits the sample matrix. However, as indicated by the indices with caution because issues surrounding goodness-of-fit indices remain debated. For instance, RESEA tends to falsely reject models when the sample size is small (Hu & Bentler, 1999). These indices rely differentially on sample size, model complexity and estimated method (Brown, 2006).

ANOVAS, Scheffe‟s and Dunnett‟s T3 multiple comparisons were used to investigate any significant differences in host residents‟ perceptions of the impact of staging the event between the three areas (i.e., Taipei City, Changhua County and Kaohsiung City). A repeated measure MANOVA was performed to examine any changes in the host residents‟ perceptions of the impact of the event. Impact factors were treated as dependent variables whilst the period of the pre- and post-event survey was the independent variable.

## RESULTS

This section presents the results of the demographic profile of the study sample, the factor analysis and discusses the results of the MANOVA to investigate significant differences.

### Demographic profile of respondents

Table 1 summarises the demographic profile of the study participants, which are categorised into „before‟ and „after‟ the TDT. There were 336 participants before the TDT and 335 after

the TDT. Over one half (55%) of respondents in the „before the event‟ category were male, 64.9% aged below 40, 45.2% worked as employees, 40.2% were college or university students, and 78.6% of the respondents earned below NT$600 000 (≈

USD$18 750) per year which is less than the national income level (NT$603 367) (Directorate-General of Budget, Accounting and Statistics, 2013). Almost the same proportion of respondents across different demographic characteristics participated in the post-event survey.

***TABLE 1*: DEMOGRAPHIC PROFILES OF RESIDENTS**

| Demographic characteristics | Before the TDT (n=336) | | After the TDT (n=335) | |
|---|---|---|---|---|
| | Frequency | % | Frequency | % |
| *Gender* | | | | |
| Male | 186 | 55.4 | 181 | 54.0 |
| Female | 150 | 44.6 | 154 | 46.0 |
| *Age group* | | | | |
| Below 20 years | 44 | 13.1 | 42 | 12.5 |
| 20–29 years | 77 | 22.9 | 79 | 23.6 |
| 30–39 years | 97 | 28.9 | 101 | 30.1 |
| 40–49 years | 51 | 15.2 | 52 | 15.5 |
| 50–59 years | 43 | 12.8 | 40 | 11.9 |
| 60 years and over | 24 | 7.1 | 21 | 6.3 |
| *Occupation* | | | | |
| Shopkeeper | 24 | 7.1 | 24 | 7.2 |
| Student | 85 | 25.3 | 82 | 24.5 |
| Employed | 152 | 45.2 | 156 | 46.6 |
| Unemployed | 11 | 3.3 | 13 | 3.9 |
| Retired | 20 | 6.0 | 17 | 5.1 |
| Others | 44 | 13.1 | 43 | 12.8 |
| *Educational level* | | | | |
| Junior high or below | 48 | 14.3 | 43 | 12.9 |
| Senior high school | 52 | 15.5 | 52 | 15.5 |
| Occupational school | 57 | 17.0 | 56 | 16.7 |
| College/University | 135 | 40.2 | 137 | 40.9 |
| Graduate and above | 44 | 13.1 | 47 | 14.0 |
| *Annual income* | | | | |
| Below 240 000 NTD[a] | 140 | 41.7 | 138 | 41.2 |
| 240 000–360 000 NTD | 54 | 16.1 | 57 | 17.0 |
| 370 000–480 000 NTD | 38 | 11.3 | 38 | 11.3 |
| 490 000–600 000 NTD | 32 | 9.5 | 31 | 9.3 |
| 610 000–720 000 NTD | 27 | 8.0 | 27 | 8.1 |
| 730 000–840 000 NTD | 14 | 4.2 | 15 | 4.5 |
| 850 000–960 000 NTD | 7 | 2.1 | 6 | 1.8 |
| 960 000 and above NTD | 24 | 7.1 | 23 | 6.9 |

[a] One US dollar was approximately equivalent to 32 New Taiwan Dollar (NTD) at time of study

**Factor analysis and reliability**

***TABLE 2*: RESULTS OF EXPLORATORY FACTOR ANALYSIS (Pre-event survey)**

| Factors | Factor loading | Commu-nalties | Eigen-value | % of Variance | Cronbach 's alpha |
|---|---|---|---|---|---|
| *Factor 1: General benefits* | | | 8.16 | 22.59 | 0.91 |
| City government made right decision to host TDT | 0.818 | 0.736 | | | |
| Would like to see city government host sports events like TDT | 0.800 | 0.672 | | | |
| Hosting TDT will give local area more opportunities to host other sporting events | 0.761 | 0.654 | | | |
| TDT will enhance recognition of the local area | 0.719 | 0.619 | | | |
| City residents" pride has risen because of TDT | 0.712 | 0.672 | | | |
| Because of the TDT, I will have more recreational opportunities | 0.604 | 0.584 | | | |
| TDT will increase local people"s interest to participate in sports | 0.598 | 0.625 | | | |
| Hosting TDT will make local area more of a tourist destination | 0.546 | 0.562 | | | |
| I believe TDT should be actively supported in local area | 0.544 | 0.563 | | | |
| *Factor 2: Community coherence and development* | | | 3.44 | 18.27 | 0.82 |
| City government listens to residents about their concerns regarding TDT | 0.741 | 0.610 | | | |
| Hosting Tour de Taiwan will increase local people"s interaction | 0.714 | 0.608 | | | |
| Hosting TDT will enhance the beauty of local community | 0.702 | 0.586 | | | |
| TDT will provide jobs for local people | 0.642 | 0.703 | | | |
| TDT will boost this area"s long-term economy | 0.585 | 0.465 | | | |
| *Factor 3: Negative impacts* | | | 1.43 | 15.45 | 0.88 |
| TDT will increase noise | 0.884 | 0.816 | | | |
| TDT will increase garbage on the street | 0.829 | 0.715 | | | |
| TDT will result in traffic congestion | 0.790 | 0.690 | | | |
| TDT will increase the crime rate in local community | 0.787 | 0.724 | | | |
| Hosting TDT will leave local area with negative image | 0.717 | 0.745 | | | |
| *Factor4: Image enhancement and tourism benefits* | | | 1.12 | 8.05 | 0.65 |
| TDT will draw national and international attention to this area | 0.778 | 0.613 | | | |
| TDT will provide a short-term boost to the economy in this area | 0.590 | 0.607 | | | |
| Visitors to TDT will contribute a sizable revenue to local economy | 0.514 | 0.590 | | | |
| **Total** | | | | **64.35** | **0.90** |

A principal components extraction with varimax rotation was conducted. For the factor analysis, the number of factors was determined using an eigenvalue equal to or greater than

1.0. Items with loadings, as well as communalities, lower than 0.40 and with double loading, were eliminated (Stevens, 1996). One item did not meet the factor loading

criteria and it was therefore excluded from further analysis. For each factor, an alpha coefficient equal to, or greater than 0.50, was the minimum coefficient that could be accepted (Baumgartner & Jackson, 1999).

***TABLE 3*: MEAN AND SD OF IMPACT STATEMENTS (pre- and post-event)**

| Statements | Pre-Games M±SD | Post-Games M±SD |
|---|---|---|
| 1. City government made right decision to host TDT | 4.18±0.79 | 4.16±0.83 |
| 2. I would like to see city government host sports events like TDT | 4.18±0.82 | 4.18±0.80 |
| 3. Hosting TDT will give local area more opportunities to host other sporting events | 4.20±0.79 | 4.21±0.79 |
| 4. TDT will enhance recognition of local area | 4.19±0.81 | 4.25±0.80 |
| 5. City residents‟ pride has risen because of TDT | 4.09±0.87 | 4.11±0.88 |
| 6. Because of TDT I will have more recreational opportunities | 3.99±0.86 | 4.06±0.86 |
| 7. TDT will increase local people‟s interest to participate in sports | 3.95±0.90 | 3.98±0.88 |
| 8. Hosting TDT will make local area more of a tourist destination | 4.08±0.86 | 4.13±0.86 |
| 9. I believe TDT should be actively supported in local area | 3.81±0.92 | 3.80±0.93 |
| 10. City government listens to residents about their concerns regarding TDT | 3.35±1.07 | 3.35±1.06 |
| 11. Hosting Tour de Taiwan will increase local people‟s interaction | 3.65±0.96 | 3.72±0.94 |
| 12. Hosting TDT will enhance beauty of local community | 3.56±1.04 | 3.58±1.02 |
| 13. TDT will provide jobs for local people | 3.49±0.99 | 3.45±1.01 |
| 14. TDT will boost this area‟s long-term economy | 3.58±1.02 | 3.56±1.05 |
| 15. TDT will increase noise | 3.05±1.09 | 2.91±1.10 |
| 16. TDT will increase garbage on the street | 3.17±1.09 | 3.03±1.09 |
| 17. TDT will result in traffic congestion | 3.29±1.17 | 3.19±1.20 |
| 18. TDT will increase the crime rate in local community | 2.47±1.12 | 2.37±1.09 |
| 19. Hosting TDT will leave local area with a negative image | 2.41±1.14 | 2.27±1.10 |
| 20. TDT will draw national and international attention to this area | 3.77±1.09 | 3.85±0.97 |
| 21. TDT will provide a short-term boost to economy in this area | 3.86±0.90 | 3.82±0.93 |
| 22. Visitors to TDT will contribute a sizable revenue to local economy | 3.83±0.90 | 3.81±0.93 |

SD= Standard Deviation 5-point Likert scale was reversed for five negative items (items 15~19)

In Table 2 the results of the factor analysis and reliability of data collected by means of the pre-event survey, are presented. A 4-factor solution, representing 22 items, was identified, with 64.35% of the variance explained. The 4 factors were labelled: *general benefits* (9 items); *community coherence and development* (5 items); *negative impacts* (5 items); and

*image enhancement and tourism benefit* (3 items). Cronbach's alpha coefficient of all sub- scales on the VTIAS ideally ranged from 0.65-0.91, to indicate the internal consistency of each of the factors.

Table 3 shows the mean scores and standard deviations for the samples before and

after the event. The overall goodness-of-fit indices showed that the proposed four-factor impact model fits the data ($\chi^2$ (205)= 708.9, CFI= 0.96, NFI= 0.94, RESEA= 0.07). The results confirmed the scales theoretical validity and the four-factor model of perceptions were deemed appropriate for this study.

**Perceptions of host residents before and after TDT**

ANOVAS were applied to determine whether significant differences existed between the 4 impact factors based on the 3 communities. As shown in Table 4, significant differences were found regarding perceptions of 4 impact factors among the communities investigated in the 3 areas. In comparison to the Taipei residents in the pre-event survey, Kaohsiung and Changhua residents were more concerned about negative impacts of hosting the 2012 TDT. Changhua residents were more optimistic about the benefits, such as general benefits, community coherence and development, as well as image enhancement and tourism benefits than Kaohsiung and Taipei residents. In the post-event survey, no differences were found regarding perceptions of community coherence and development based on the communities in the three areas, whereas significant differences were found for general benefits, image enhancement and tourism benefits and negative impacts. Taipei and Changhua residents perceived a higher level of positive impacts (general benefits and image enhancement and tourism benefits) than Kaohsiung residents and a lower level of negative impacts than Kaohsiung residents.

***TABLE 4*: ONE-WAY ANALYSIS OF VARIANCE EXAMINING DIFFERENCES IN PERCEPTIONS OF IMPACT FACTORS OF HOSTING AREAS**

| Factors | Pre-event | | | F | Post Hoc | Post-event | | | F | Post Hoc |
|---|---|---|---|---|---|---|---|---|---|---|
| | K | C | T | | | K | C | T | | |
| General benefits | 3.78 | 4.54 | 3.87 | 84.82*** | C>K C>T | 3.88 | 4.23 | 4.21 | 14.72*** | C>K T>K |
| Community coherence & development | 2.99 | 4.09 | 3.16 | 119.13*** | C>K C>T | 3.40 | 3.60 | 3.56 | 2.40 | |
| Image enhance-ment & tourism benefits | 3.54 | 4.30 | 3.62 | 64.07*** | C>K C>T | 3.72 | 3.81 | 3.95 | 4.31*** | T>K |
| Negative impacts | 2.92 | 3.05 | 3.32 | 7.44** | T>K T>C | 2.99 | 3.43 | 3.33 | 10.55* | T>K C>K |

K= Kaohsiung City; C= Changhua County; T= Taipei City *p<0.05; **p<0.01; ***p<0.001

A repeated measure MANOVA was performed to investigate the changing perceptions of the pre- and post-event impact (Table 5). Four dependent variables were used: general benefits, community coherence and development, negative impacts and image enhancement and

tourism benefits. The independent variable was the mega-event. There was a statistically significant difference between the pre- and post-event on the dependent variables: F (4, 235)
= 3.69, p<0.01; Wilk‟s Lambda= 0.94, Partial eta squared= 0.06. Univariate tests were employed to analyse which impact dimensions were significantly different over

time. An inspection of the mean scores indicated that post-event reported slightly higher levels of general benefits (M= 4.19, SD= 0.63) than pre-event (M= 4.01, SD= 0.65); whereas post- event showed higher levels of negative impacts (M=3.44, SD= 0.85) than pre-event (M= 3.19, SD= 0.87). Overall, perceived benefits (general benefits, community coherence and development and image enhancement and tourism benefits) had higher mean scores than expected benefits. This suggests that local residents had higher expectations of the benefits that the TDT would generate for their community to some degree, than were met.

***TABLE 5*: REPEATED MEASURES MANOVA RESULTS BEFORE AND AFTER TDT**

| Factors | Mean | | Mean Diff | F | p |
|---|---|---|---|---|---|
| | Before | After | | | |
| General benefits | 4.01 | 4.19 | +0.18 | 10.71** | 0.001 |
| Community coherence & development | 3.41 | 3.53 | +0.12 | 2.96 | 0.087 |
| Image enhancement & tourism benefits | 3.75 | 3.86 | +0.11 | 2.63 | 0.107 |
| Negative impacts | 3.19 | 3.44 | +0.25 | 9.29** | 0.003 |

All items were assessed on a 5-point scale (1= strongly disagree; 3= no opinion; 5= strongly agree). N=235 *p<0.05 **p<0.01

The positive impacts that were expected prior to the TDT included general benefits (M= 4.01), followed by image enhancement and tourism benefits (M= 3.75) and community coherence and development (M= 3.41). As per the pre-event survey, the highly perceived positive impacts subsequent to the TDT were general benefits (M= 4.19), followed by image enhancement and tourism benefits (M= 3.86) and community coherence and development (M= 3.53). The largest gap score (0.18) between the pre- and post-event surveys of positive impacts was for general benefits. Expected costs (M= 3.19) had a significantly lower mean score than perceived costs (M= 3.44), indicating that local residents initially had „high" expectations about the negative impacts of the TDT. However, throughout the phases of planning and event management, the negative impacts of the TDT were lower than anticipated. It should be noted that of all the impact factors, the negative impacts created the largest gap score between the two periods.

## DISCUSSION AND IMPLICATIONS

The principal purpose of this study was to assess host residents" views and perceptions of the impact of staging the 2012 TDT. Host residents" perceptions of the positive and negative impacts changed significantly over time. In the lead up to the hosting of the TDT, the residents believed that the event could bring general benefits by enhancing Taiwan"s international image, which would increase tourism. However, they adopted a neutral attitude toward the negative impacts. In line with the pre-event expectations, the post-event

perceptions indicated that the TDT generated more benefits and less negative impacts than originally expected in the host cities. Overall, the findings of this study are partially similar to Bull and Lovell (2007) and Balduck *et al.* (2011). Before the

arrival of the TDF, Canterbury residents anticipated that the event would result in more benefits for the economy, the country‟s image, and tourism, which would have less of a socio-cultural impact. Ghent residents had high expectations of image and cultural benefits rather than the development of the economy and tourism. After the TDF, Ghent residents did perceive cultural and image benefits and less negative impacts, which is similar to the host residents of the TDT. If the primary objective of both the TDT and the TDF is to promote the host destination to the world, their influential stakeholders (the host residents) have clearly recognised this fact.

The TDT is staged across Taiwan‟s seven main cities over one week. Unlike each stage of the TDF that starts and finishes in different cities, the start and finish lines of the TDT are in the same city in each stage. As Balduck *et al*. (2011) observed a major event of this kind might only have a limited time effect and a small impact on each host city. This is more the case for the 2012 TDT than it is for the TDF. It is reported that the „Taipei CYCLE‟ is perhaps the sole and prominent affiliated activity organised because of the TDT. In contrast, the host destinations of the TDF, for example, Canterbury and Ghent, took the opportunities to organise social and cultural activities prior to, and during the race week, in order to broaden local residents‟ experiences (Bull & Lovell, 2007; Balduck *et al*., 2011). Therefore, residents held opinions about the impacts of the 2012 TDT on a shorter-term basis. Conversely, our study also suggests that the majority of residents were informed of the arrival of the TDT and related news by public media (newspaper, TV, the Internet). When event organisers and local authorities consider the inclusion of more social activities into a broader TDT network in the future, local and national media broadcasts will provide the required intense publicity. This should encourage the host residents to become involved in the TDT, and probably even more previously non-sports enthusiasts will be attracted to the event because of its „carnivalesque atmosphere.‟

Residents‟ perceptions of impacts of the 2012 TDT in the three areas were compared. Before the arrival of the event, Changhua residents viewed the impacts more positively than Kaohsiung and Taipei residents. After the event, Changhua residents perceived fewer benefits than expected prior to the event. Specifically, Changhau and Taipei residents substantially perceived general benefits than Kaohsiung residents, while Taipei residents who lived in the capital city earned much attention from national and international media and enjoyed revenue brought in by tourism. Although the selected communities of Kaohsiung were located in tourist areas (Love River area), residents received less tourism benefits than Taipei (commercial area) and Changhua (tourist area) residents.

To some degree, the TDT aims to stimulate tourism growth for the host destinations and Taiwan as a whole, as each stage of the event is subsidised through tax revenue. As Pennington-Gray and Holdank (2002:178) argues, “Many events can be insular; the spectator merely comes to attend the event and then leaves, resulting in little net gain for the tourism venues”. Kaohsiung residents also perceived a higher level of negative impacts than the Taipei and Changhua residents. This may be due to the traffic congestion they experienced. Consequently, Kaohsiung residents received less benefits and higher negative impacts than other host destinations. This implies that local tourism providers should work closely with the

cycling association to combine event and tourism packages based on the needs of local communities. A more proactive approach would help to alleviate residents‟ concern while winning a high level of support for hosting the TDT in future.

Regarding pre-event perceptions of positive impacts, residents had high expectations of general benefits, as well as image and tourism benefits, but considered community coherence and development to be the least positive impact. The perceived benefits were higher than expected, except regarding community coherence and development, as issues such as an increase in jobs for local people, a boost to the area‟s long-term economy and local social interactions, were the least perceived benefits. This finding is similar to the study by Balduck *et al*. (2011). As indicated by Desbordes (2007), a city that staged the TDF would indeed benefit from the short-term spending of spectators, an increased awareness of the urban locales and a boost to tourism. The residents hosting the TDT may well recognise this, but they are also sceptical about how they could substantially benefit over the longer-term, especially when a very low percentage of them are shopkeepers (7%). Therefore, the social exchange aspect may be perceived as less important.

Residents took a neutral attitude toward negative impacts prior to the 2012 TDT and perceived fewer impacts than expected. Issues regarding traffic congestion, garbage and noise were expected to have the largest negative impacts, followed by crime rate, with negative image considered to be the least significant problem. Post-event perceptions suggest that actual congestion and overall environmental impact were less than originally expected. Our findings reveal gap scores for negative impact that were the largest and positive, suggesting that these issues did not occur as much as anticipated during the event. However, impact of traffic was still perceived as the most serious problem. This may be unavoidable as this is also the case in the TDF (Bull & Lovell, 2007; Balduck *et al*., 2011). In fact, it was observed by the investigators that there was no information available about road closures and traffic control before the event, especially when those routes went through city centres during rush hour. Many had no idea about why they were stuck on the road for half an hour or longer until they saw the cyclists pass by. In future, event organisers and local authorities of the host cities will need a plan that allows local residents to select their optimal traffic route. Negative perceptions regarding hosting the event could then be managed.

## CONCLUSIONS

Overall, the findings suggest that most host residents supported the hosting of the 2012 TDT because they believed it would bring positive change to the local area. However, more direct daily concerns, such as the need for community development and specific economic benefits, have not been sufficiently addressed in the planning of the TDT. Host residents differ significantly in the perceptions of event impacts based on different geographical areas. For this reason, strategies and event-related activities that would create more interaction with communities and promote each host destination should be designed in accordance to their needs. The event will be restaged in host cities in the future. Information based on host residents‟ pre- and post-event perceptions may assist event planners, sponsors and entrepreneurs to better understand the factors that are vital to the success of future events, but were not well managed during the planning stages.

This was the first time that host resident reactions to the staging of a cycling race in Taiwan were analysed and from this analysis, several contributions were made to the subject area. Importantly, particular insight was gained in the host residents‟ perceptions of impacts of the TDT. The current study is the only study conducted that focused beyond TDF. In comparison to the results of previous studies, the results of this study offer a better understanding of the dynamic process (pre- and post-event) of staging a cycling race. While most previous research was restricted to investigating only one city or stage that hosted the TDF, this research examined residents‟ perceptions of event impacts covering wider geographical areas. The findings of this research can assist in the overall strategic planning of the event, as well as planning for each host destination.

The collection of data during the event and the post-event period presented special difficulties for this study. It must be noted that using a short interval to determine changing opinions about expected and perceived impacts may not be sufficient. However, as the cities and the communities have hosted the TDT for a long period, it could be assumed that local residents are familiar with the issues investigated. Researchers should be encouraged to regularly collect information as the cumulative data might assist event organisers, sponsors and local authorities to make wise decisions.

Since research on the perception of sporting events of this type has only just begun to flourish, local residents are the most targeted stakeholders. However, various stakeholders may perceive the event in a different way. In addition to the views of residents that need to be considered, the opinions of stakeholders, such as sponsors, media, athletes, international sport federations, local authorities and visitors share the common goal of achieving a successful event. It is therefore suggested that a wider range of stakeholders should be included in future studies to facilitate a comprehensive understanding of event impacts.

One of the main purposes of each stage is to promote the host area to the world through events, including the TDT and the TDF. For the TDT, the event tourism strategies of each stage should be addressed in an overall package because its distance and the number of host cities is on a smaller scale and geographically concentrated, in contrast to the TDF. For the TDF, the contest is normally composed of 20 stages covering a far longer distance than those of the TDT. Strategies in each stage may be on a project-by-project basis. Therefore, future studies and event organisers should consider not only the congruence between the event image and the destination image, but also the differences of such congruency relating to tourism strategies in events of different scales and in different geographical areas.

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# PSYCHOLOGICAL SKILLS, PLAYING POSITIONS AND PERFORMANCE OF AFRICAN YOUTH SOCCER TEAMS

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***ABSTRACT***

*The purpose of this study was to investigate the psychological skills of African youth soccer players in different playing positions. The role of psychological skills and overall team performance was also determined. The sample consisted of male soccer players (N=152) between the ages of 14 and 18 years from 10 African countries competing in the 2010 Copa Coca-Cola soccer tournament. A cross-sectional survey design was used to determine the players' psychological skills by means of the Bull's Mental Skills Questionnaire and the Athletic Coping Skills Inventory-28 (ACSI-28). Results yielded insignificant differences between the subscale scores of the players in different playing positions. Concentration was the only psychological variable associated with performance. The middle four-ranked teams outscored the most successful and least successful teams in relaxation. Findings from this study could not confirm the widely acclaimed research assumption that psychological skill demands differ among players in different playing positions, nor the positive correlation between psychological skills and team success. Future research should investigate the perceptions and extent of psychological skills training among African youth soccer players, as well as the efficiency of psychological skills interventions aimed at enhancing overall team performance.*

**Key words**: Athletic Coping Skills Inventory-28 (ACSI-28); Bull's Mental Skills Questionnaire; Psychological skills; Playing positions; Youth soccer.

## INTRODUCTION

Soccer is rated one of the most popular sports in the world (Kurt *et al.,* 2012). Success and consistent performance in soccer is not just archetypal to the physical

and tactical modalities employed, but also the psychological skills incorporated into practice and competition (Cox & Yoo, 1995). Research findings indicate a positive association between psychological characteristics and elite sport performance (Orlick & Partington, 1988). William and Krane's (2006) study buttressed this proposition by indicating that psychological skills encompassing imagery, focussing attention and maintaining concentration, controlling anxiety, positive self- talk and goal setting are antecedents of peak performance. Behncke (2004) highlighted the importance of these psychological skills in implementing cognitive-somatic interventions aimed at enhancing performance. It is also argued that psychological skills are essential for maintaining expert performance (Durand-Bush & Salmela, 2002).

A number of studies have investigated psychological factors and their respective influence on soccer players' performance. Salmon *et al.* (2008) examined the motivational and cognitive use of imagery by soccer players of various skill levels. They found that soccer players use imagery as a motivational tool in competition more effectively than any other form of cognitive training. It was also revealed that soccer players competing at national level use imagery more than players competing at provincial and local levels. It can thus be assumed that players from different competitive levels differ in their usage of psychological skills.

Lowther *et al.* (2002) found that self-efficacy was also positively correlated with the performance of soccer players participating in the Amputee World Cup. They indicated that psychological skills, such as activation and relaxation ability increased the self-efficacy levels of participants, resulting in improved performance.

Self-talk was highlighted by Hardy (2006) as an important self-instructional and motivational tool to improve performance. In agreement with this, Johnson *et al.* (2004) found that self- talk lead to an improvement in specific performance subcomponents in soccer. This particular study revealed that the majority of female soccer players' low-drive shooting performances improved following a cognitive-specific self-talk intervention. This emphasised the importance of the usage of psychological skills in improving performance-related factors in soccer.

In the refinement of research on psychological skills, it has become apparent that intervention programmes are tailored to address the specific demands of the sport and the different playing positions (Cox & Yoo, 1995; Sewell & Edmundson, 1996; Andrew *et al.,* 2007; Eloff *et al.,* 2011). Thelwell *et al.* (2006) assessed the efficacy of a psychological intervention on the technical skills pertinent to soccer midfielders, such as their ability to bring the ball under control, completing successful passes and making successful tackles. It was found that the psychological skills training plan, comprising relaxation, imagery and self-talk, led to improvement and consistency in each of the dependent variables deemed specific to the midfield position among all the participants. Such findings suggest that psychological skills training have a facilitative effect on position-specific performance components in soccer. However, a recent study maintains that there is no meaningful difference between position-specific play in soccer and various psychological attributes, such as loneliness, self-esteem, trait anger and anger expression (Kurt *et al.,* 2012).

As mentioned, there have been various studies examining the efficacy of

psychological skills interventions on performance subcomponents in soccer. However, Sadeghi *et al.* (2010) have emphasised the need to look into the mental attributes associated with overall soccer performance. These researchers gathered qualitative information from a sample of college soccer players to determine which psychological skills are needed to perform optimally. Their findings revealed that imagery, goal setting, self-talk and relaxation were the psychological skills most needed in soccer. These results are in line with the findings of Coetzee *et al.* (2006), who identified psychological skills, such as concentration, performing optimally under pressure, achievement motivation, goal setting and arousal control, as important discriminators between successful and less successful soccer players.

## PURPOSE OF THE RESEARCH

Although the development of sport psychology has been documented for more than a century (Norman Triplett published the first sport psychology paper in 1898), it is still maturing when it comes to on-the-field support to enhance athlete performance, especially in soccer (Junge *et al.,* 2000). Regardless of the existing findings pertaining to the role of psychological factors in soccer, knowledge about psychological skills usage within a competitive soccer environment is limited. There still remains a need to assess the psychological antecedents of overall performance scores in this open-skill sport, as well as determining its suitability for the applied practitioner (Reilly & Gilbourne, 2003).

The purpose of this study was subsequently to investigate the psychological skills and positional differences among African youth soccer players. It was hypothesised that this study could provide useful insights into identifying position-specific psychological characteristics for the purpose of developing individualised psychological skills training programmes in soccer. It could also demonstrate the relevance of the usage of psychological skills in achieving success in youth soccer tournaments.

## METHODOLOGY

### Participants

The sample consisted of African soccer players (N=152), who competed in the 2010 Copa Coca-Cola soccer tournament. The participating countries were: Botswana, Kenya, Malawi, Namibia, Nigeria, South Africa, Tanzania, Uganda, Zambia, Zimbabwe, and an invitational team, Ecabu, which consisted of individual players from the participating countries. The ages of the players ranged between 14 and 18 years with a mean age of 16.2±1.13 years. Almost half (43.9%) of the players had been playing soccer at an international level for one year. This was followed by a third (33.3%) who indicated that they had participated internationally for two years. The remainder of the players had participated for longer than two years, with one respondent reporting that he had participated at an international level for six years. A large number (n=65) of the players were midfielders, followed by defenders (n=44), forwards (n=26) and goal keepers (n=17).

Based on the criteria of winning matches and the eventual log placement, the respective teams were categorised into 3 groups, namely the top 4 teams (n=53), the

middle 4 teams (n=55) and the 3 least successful teams (n=44).

**Testing procedure**

The study was approved by the organisers of the 2010 Copa Coca-Cola tournament and ethical approval was granted by the Tshwane University of Technology (Number 2010/07/005). An information letter explaining the aims of the study was given to all the players and coaches, after which informed consent were given by the players before they were allowed to participate in the study.

The players were tested on the days set aside for psychological and physical evaluations during the tournament. The purpose of the study and the confidentiality of each individual

player's information were explained to the participants and coaches. Coaches could, if requested, get access to their team's overall results, but not to individual players' results. The reason for this restriction was to reduce the occurrence of 'socially desirable' responses from participants and to limit the influence it might have on team selection. All the players from the participating countries were included in the survey. The questionnaires, which included demographic information and measures of psychological skills, were employed in this study and were administered with the assistance of supervisors and coaching staff.

**Measuring instruments**

The demographical information consisted of the following: country represented, age, number of years playing soccer at a national level and playing position.

Psychological skills were measured by means of 2 valid and reliable questionnaires: the Athletic Coping Skills Inventory-28 (ACSI-28) (Smith *et al.*, 1995) and the Mental Skills Questionnaire of Bull *et al.* (1996). The rationale for using 2 different psychological skills questionnaires was to target a broader range of skills and to uncover the multidimensional nature of skills that are employed by young soccer players at this level of performance. The Mental Skills Questionnaire and the ACSI-28 in combination measured a total of 15 psychological skills and partially overlapped on 5 subscales (concentration, confidence, motivation, goal setting, and mental preparation). The remaining 10 subscales measure a broad spectrum of psychological skills relevant to this particular level of soccer participation.

***ACSI-28***

The ACSI-28 (Smith *et al.*, 1995) measures coping with adversity, peaking under pressure, goal setting and mental preparation, concentration, freedom from worry, confidence and motivation, and coachability. These constructs are composed of items that are measured on a 4-point Likert-type scale ranging from 0 (*almost never*) to 3 (*almost always*). Each of the 7 construct scores can range from 0 to 12, and are summated to yield a general coping skills score that can range from 0 to 84. The results are expressed as percentage values, with higher values indicating better skill levels. Each statement in the questionnaire describes experiences of other athletes, which prompts the participant to indicate the frequency of similar experiences. The

ACSI-28 was used in a one-week study on 97 male and female college athletes that yielded a test-retest reliability for a personal coping resource score of $r$=0.87 and a total internal consistency reliability score of $r$=0.86 (Smith *et al.,* 1995).

***Mental Skills Questionnaire***

The Mental Skills Questionnaire (Bull *et al.,* 1996) measures imagery, mental preparation (goal setting), self-confidence, anxiety and worry management, concentration, relaxation and motivation. The questionnaire consists of 28 items that assess respondents on a 6-point Likert scale ranging from 1 (*strongly disagree)* to 6 *(strongly agree)*. Bull *et al.* (1996) standardised the questionnaire by using 219 athletes to establish generally high Cronbach's alpha levels of
0.59 to 0.80 for the 7 subscales. The 7 subscales have also been translated into Dutch and have yielded generally similar Cronbach's alpha levels of 0.59 to 0.80 (Snauwaert, 2001). South African norms for the questionnaire have recently been established in a study by Edwards and Steyn (2011), using the data of 419 male and female university students, that

demonstrated test-retest reliability levels that concurred with those of 3 other South African studies (Danariah, 2007; Edwards & Edwards, 2007; Edwards & Steyn, 2008).

**Statistical analysis**

The data were analysed by means of the SPSS (*Statistical Product and Service Solutions*) package. Frequency analysis was used to describe the sample. Descriptive statistics were used to give an indication of mean scores on the psychological skill indices according to playing position and tournament ranking. These descriptive statistics included the number of participants, minimum and maximum values, mean scores and standard deviations. The mean score was used to describe central tendency.

Inferential statistics were applied to determine whether statistically significant differences existed between playing positions and rankings of teams, for each of the psychological skills. A One-Way Analysis of Variance (ANOVA) was used to determine whether statistically significant ($p \leq 0.05$) differences existed between the psychological skills subscales for the various playing positions and groupings of team performance.

Cronbach's alpha indices were calculated for both psychological skills measures employed in the study to ensure the reliability of these questionnaires for the particular data-set (Thomas *et al.,* 2005). Table 1 illustrates the Cronbach's Alpha calculated for the 2 psychological measures.

***TABLE 1*: RELIABILITY OF PSYCHOLOGICAL SKILL MEASURES**

| **Cronbach's Alpha for the Total Sample** | | | |
|---|---|---|---|
| Mental Skills Questionnaire (Subscales) | | Athletic Coping Skills Inventory-28 | |
| Imagery | 0.54 | Average coping skills score | 0.53 |

| | | | |
|---|---|---|---|
| Mental preparation | 0.71 | Coping with adversity | 0.49 |
| Self confidence | 0.66 | Peaking under pressure | 0.58 |
| Anxiety and worry management | 0.58 | Goal setting and mental preparation | 0.67 |
| Concentration | 0.55 | Concentration | 0.67 |
| Relaxation | 0.56 | Freedom from worry | 0.59 |
| Motivation | 0.68 | Confidence and motivation | 0.55 |
| | | Coachability | 0.17 |

Table 1 illustrates that both the instruments used in this study had moderate Cronbach's Alpha values except for the coping with adversity and coachability subscales (ACSI-28). The latter will not be considered for any further statistical analysis as their internal consistency was too low. Therefore, the results should be interpreted with caution as it appears that the conceptualisation of the constructs might be different in typical African contexts, compared to the Western milieu in which these instruments were developed.

## RESULTS

None of the results of the analyses presented in Table 2 and Table 3 showed any statistically significant differences. Non-parametric statistics were employed by means of the Kruskall- Wallis test.

***TABLE 2*: BULL'S MENTAL SKILLS QUESTIONNAIRE: DESCRIPTIVE STATISTICS OF POSITIONAL COMPARISONS (N=152)**

| Mental skills | Position | Mean % | SD | SE | Minimum % | Maximum % | F-value | p-value |
|---|---|---|---|---|---|---|---|---|
| Imagery | Goalkeeper | 75.25 | 4.58 | 1.15 | 41.67 | 100.00 | 0.16 | 0.92 |
| | Defender | 76.79 | 4.21 | 0.63 | 29.17 | 100.00 | | |
| | Midfielder | 77.20 | 4.46 | 0.59 | 29.17 | 100.00 | | |
| | Forward | 79.17 | 4.44 | 0.89 | 45.83 | 100.00 | | |
| | Total | 77.21 | 4.36 | 0.36 | 29.17 | 100.00 | | |
| Mental preparation | Goalkeeper | 77.46 | 5.14 | 1.25 | 37.50 | 100.00 | 0.71 | 0.55 |
| | Defender | 84.33 | 4.35 | 0.68 | 33.33 | 100.00 | | |
| | Midfielder | 84.21 | 3.94 | 0.50 | 41.67 | 100.00 | | |
| | Forward | 83.17 | 4.42 | 0.87 | 41.67 | 100.00 | | |
| | Total | 83.29 | 4.28 | 0.35 | 33.33 | 100.00 | | |
| Self-confidence | Goalkeeper | 79.42 | 4.90 | 1.19 | 37.50 | 100.00 | 0.18 | 0.91 |
| | Defender | 77.96 | 4.93 | 0.76 | 33.33 | 100.00 | | |
| | Midfielder | 78.96 | 5.38 | 0.69 | 25.00 | 100.00 | | |
| | Forward | 81.79 | 3.68 | 0.75 | 58.33 | 100.00 | | |
| | Total | 79.21 | 4.90 | 0.41 | 25.00 | 100.00 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Anxiety and worry management | Goalkeeper | 67.79 | 5.38 | 1.39 | 16.67 | 100.00 | 0.23 | 0.87 |
| | Defender | 67.36 | 5.06 | 0.79 | 16.67 | 100.00 | | |
| | Midfielder | 64.25 | 5.23 | 0.67 | 16.67 | 100.00 | | |
| | Forward | 66.67 | 5.08 | 1.06 | 20.83 | 100.00 | | |
| | Total | 65.96 | 5.13 | 0.43 | 16.67 | 100.00 | | |
| Concentration | Goalkeeper | 75.75 | 4.68 | 1.14 | 33.33 | 100.00 | 0.15 | 0.93 |
| | Defender | 75.88 | 5.54 | 0.84 | 16.67 | 100.00 | | |
| | Midfielder | 76.79 | 5.02 | 0.65 | 20.83 | 100.00 | | |
| | Forward | 73.38 | 4.26 | 0.89 | 33.33 | 100.00 | | |
| | Total | 75.83 | 4.99 | 0.42 | 16.67 | 100.00 | | |

***TABLE 2. (cont.)***

| **Mental skills** | **Position** | **Mean %** | **SD** | **SE** | **Minimum %** | **Maximum %** | **F-value** | **p-value** |
|---|---|---|---|---|---|---|---|---|
| Relaxation | Goalkeeper | 75.75 | 5.17 | 1.26 | 33.33 | 100.00 | 0.75 | 0.53 |
| | Defender | 80.58 | 4.26 | 0.66 | 33.33 | 100.00 | | |
| | Midfielder | 82.75 | 3.92 | 0.49 | 45.83 | 100.00 | | |
| | Forward | 81.86 | 4.15 | 0.81 | 37.50 | 100.00 | | |
| | Total | 81.21 | 4.20 | 0.34 | 33.33 | 100.00 | | |
| Motivation | Goalkeeper | 83.88 | 4.22 | 1.06 | 45.83 | 100.00 | 0.44 | 0.73 |
| | Defender | 86.21 | 3.10 | 0.48 | 45.83 | 100.00 | | |
| | Midfielder | 88.29 | 3.50 | 0.44 | 37.50 | 100.00 | | |
| | Forward | 86.50 | 4.13 | 0.83 | 33.33 | 100.00 | | |
| | Total | 86.92 | 3.57 | 0.30 | 33.33 | 100.00 | | |

Goal keepers: n=17; Midfielders: n=65; Forwards: n=26; Defenders: n=44.

***TABLE 3*: ACSI-28: DESCRIPTIVE STATISTICS OF POSITIONAL COMPARISONS (N=152)**

| **Mental skills** | **Position** | **Mean %** | **SD** | **SE** | **Minimum %** | **Maximum %** | **F-value** | **p-value** |
|---|---|---|---|---|---|---|---|---|
| Average coping skills score | Goalkeeper | 59.29 | 2.61 | 0.56 | 25.00 | 92.85 | 0.70 | 0.55 |
| | Defender | 64.01 | 2.34 | 0.35 | 20.23 | 97.61 | | |
| | Midfielder | 62.79 | 2.50 | 0.31 | 17.85 | 100.00 | | |
| | Forward | 61.21 | 2.25 | 0.45 | 23.80 | 95.24 | | |
| | Total | 61.83 | 2.43 | 0.41 | 21.72 | 96.42 | | |
| | Goalkeeper | 56.33 | 2.97 | 0.72 | 25.00 | 100.00 | 1.31 | 0.27 |
| | Defender | 67.08 | 1.91 | 0.29 | 33.33 | 100.00 | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Coping with adversity | Midfielder | 65.17 | 2.46 | 0.31 | 25.00 | 100.00 | | |
| | Forward | 64.33 | 1.90 | 0.38 | 33.33 | 91.67 | | |
| | Total | 64.58 | 2.30 | 0.19 | 25.00 | 100.00 | | |
| Peaking under pressure | Goalkeeper | 63.25 | 2.18 | 0.53 | 33.33 | 91.67 | 0.64 | 0.59 |
| | Defender | 62.25 | 2.67 | 0.41 | 8.33 | 100.00 | | |
| | Midfielder | 62.92 | 2.78 | 0.35 | 16.67 | 100.00 | | |
| | Forward | 56.00 | 2.70 | 0.54 | 8.33 | 100.00 | | |
| | Total | 61.58 | 2.67 | 0.22 | 8.33 | 100.00 | | |

***TABLE 3. (cont.)***

| **Mental skills** | **Position** | **Mean %** | **SD** | **SE** | **Minimum %** | **Maximum %** | **F-value** | **p-value** |
|---|---|---|---|---|---|---|---|---|
| Goal setting and mental preparation | Goalkeeper | 67.17 | 3.17 | 0.79 | 25.00 | 100.00 | 0.00 | 1.00 |
| | Defender | 66.67 | 2.65 | 0.40 | 8.33 | 100.00 | | |
| | Midfielder | 66.83 | 2.89 | 0.37 | 8.33 | 100.00 | | |
| | Forward | 67.00 | 2.66 | 0.54 | 8.33 | 100.00 | | |
| | Total | 66.83 | 2.79 | 0.23 | 8.33 | 100.00 | | |
| Concentration | Goalkeeper | 59.33 | 2.12 | 0.51 | 33.33 | 83.33 | 1.73 | 0.16 |
| | Defender | 69.08 | 2.32 | 0.36 | 33.33 | 100.00 | | |
| | Midfielder | 61.50 | 2.45 | 0.31 | 16.67 | 100.00 | | |
| | Forward | 62.00 | 1.89 | 0.38 | 33.33 | 91.67 | | |
| | Total | 63.50 | 2.31 | 0.19 | 16.67 | 100.00 | | |
| Freedom from worry | Goalkeeper | 45.58 | 2.27 | 0.55 | 16.67 | 83.33 | 0.57 | 0.63 |
| | Defender | 50.00 | 2.70 | 0.41 | 0.00 | 100.00 | | |
| | Midfielder | 47.75 | 2.79 | 0.36 | 0.00 | 100.00 | | |
| | Forward | 42.75 | 2.60 | 0.54 | 8.33 | 91.67 | | |
| | Total | 47.41 | 2.66 | 0.22 | 0.00 | 100.00 | | |
| Confidence and motivation | Goalkeeper | 68.67 | 3.35 | 0.81 | 16.67 | 100.00 | 0.98 | 0.41 |
| | Defender | 76.00 | 2.25 | 0.34 | 41.67 | 100.00 | | |
| | Midfielder | 77.83 | 2.21 | 0.28 | 33.33 | 100.00 | | |
| | Forward | 76.75 | 2.32 | 0.47 | 41.67 | 100.00 | | |
| | Total | 76.08 | 2.39 | 0.20 | 16.67 | 100.00 | | |
| Coachability | Goalkeeper | 54.67 | 2.19 | 0.55 | 25.00 | 91.67 | 0.33 | 0.80 |
| | Defender | 57.00 | 1.91 | 0.29 | 16.67 | 83.33 | | |
| | Midfielder | 57.50 | 1.95 | 0.25 | 25.00 | 100.00 | | |
| | Forward | 59.67 | 1.70 | 0.34 | 33.33 | 91.67 | | |
| | Total | 57.42 | 1.91 | 0.16 | 16.67 | 100.00 | | |

Goal keepers: n=17; Midfielders: n=65; Forwards: n=26; Defenders: n=44.

As indicated earlier, the teams were divided into 3 groups based on their ranking after the soccer tournament. Statistically significant differences were found for both instruments (Table 4 and Table 5).

***TABLE 4*: BULL'S MENTAL SKILLS QUESTIONNAIRE: DESCRIPTIVE STATISTICS & SIGNIFICANT DIFFERENCES REGARDING MENTAL SKILLS OF THREE GROUPS (N=152)**

| Mental skills | Group | Mean % | SD | SE | Minimum % | Maximum % | F-value | p-value |
|---|---|---|---|---|---|---|---|---|
| Imagery | Gr. A (Top 4) | 79.50 | 3.62 | 0.52 | 45.83 | 100.00 | 3.88 | 0.02* |
| | Gr. B (Middle 4) | 80.63 | 4.40 | 0.60 | 37.50 | 100.00 | | |
| | Gr. C (Bottom 3) | 71.29 | 4.64 | 0.70 | 29.17 | 100.00 | | |
| | Total | 77.46 | 4.32 | 0.36 | 29.17 | 100.00 | | |
| Mental preparation | Group A (Top 4) | 81.58 | 4.43 | 0.61 | 33.33 | 100.00 | 0.71 | 0.49 |
| | Group B (Middle 4) | 85.54 | 4.34 | 0.58 | 41.67 | 100.00 | | |
| | Group C (Bottom 3) | 82.83 | 3.83 | 0.60 | 45.83 | 100.00 | | |
| | Total | 83.42 | 4.23 | 0.35 | 33.33 | 100.00 | | |
| Self-confidence | Group A (Top 4) | 80.29 | 4.30 | 0.61 | 33.33 | 100.00 | 0.49 | 0.61 |
| | Group B (Middle 4) | 80.00 | 5.26 | 0.70 | 25.00 | 100.00 | | |
| | Group C (Bottom 3) | 76.38 | 5.22 | 0.80 | 37.50 | 100.00 | | |
| | Total | 79.04 | 4.93 | 0.41 | 25.00 | 100.00 | | |
| Anxiety and worry management | Group A (Top 4) | 66.33 | 5.04 | 0.71 | 16.66 | 100.00 | 0.14 | 0.87 |
| | Group B (Middle 4) | 65.71 | 5.55 | 0.76 | 16.66 | 100.00 | | |
| | Group C (Bottom 3) | 64.00 | 4.82 | 0.77 | 20.83 | 100.00 | | |
| | Total | 65.46 | 5.15 | 0.43 | 16.66 | 100.00 | | |
| Concentration | Group A (Top 4) | 80.46 | 4.10 | 0.57 | 25.00 | 100.00 | 3.04 | 0.05* |
| | Group B (Middle 4) | 75.46 | 4.83 | 0.66 | 16.66 | 100.00 | | |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | Group C (Bottom 3) | 70.00 | 5.73 | 0.90 | 20.83 | 100.00 | |
| | Total | 75.71 | 4.93 | 0.41 | 16.66 | 100.00 | |

***TABLE 4. (cont.)***

| Mental skills | Group | Mean % | SD | SE | Minimum % | Maximum % | F-value | p-value |
|---|---|---|---|---|---|---|---|---|
| Relaxation | Group A (Top 4) | 78.50 | 4.04 | 0.57 | 37.50 | 100.00 | 6.63 | 0.00** |
| | Group B (Middle 4) | 87.50 | 3.67 | 0.48 | 45.83 | 100.00 | | |
| | Group C (Bottom 3) | 76.25 | 4.44 | 0.68 | 33.33 | 100.00 | | |
| | Total | 81.29 | 4.17 | 0.34 | 33.33 | 100.00 | | |
| Motivation | Group A (Top 4) | 87.25 | 3.21 | 0.44 | 33.33 | 100.00 | 1.03 | 0.36 |
| | Group B (Middle 4) | 88.46 | 3.61 | 0.48 | 37.50 | 100.00 | | |
| | Group C (Bottom 3) | 84.17 | 3.92 | 0.61 | 45.83 | 100.00 | | |
| | Total | 86.88 | 3.57 | 0.29 | 33.33 | 100.00 | | |

Group A (Top 4 teams): n=53; Group B (Middle 4 teams): n=55; Group C (Bottom 3 teams): n=44.
* $p \leq 0.05$; ** $p \leq 0.01$; † $p \leq 0.10$

Statistically significant differences were found between the 3 groups. The imagery scores of the middle 4 teams were significantly higher than those of the bottom 3 teams. This difference was significant at the 0.05 level ($F$=3.88; $p$=0.02). Even though the top 4 teams also had higher scores than the bottom 3 teams, the difference was not statistically significant. The concentration ability of the 3 groups also differed significantly ($F$=3.04; $p$=0.05). The top 4 teams had significantly higher scores than the bottom 3 teams.The relaxation scores of the 3 groups also differed significantly ($F$=6.63; $p$=0.002). The middle 4 teams had significantly higher relaxation scores than both the top 4 and bottom 3 teams.

The confidence and motivation scale was the only subscale that showed statistically significant differences at the 0.05 level of significance ($F$=4.400; $p$=0.014). The middle 4 teams had significantly higher scores than the bottom 3 teams. Even though the middle 4 teams outscored the top 4 teams, this difference was statistically insignificant.

***TABLE 5*: ACSI-28: DESCRIPTIVE STATISTICS & SIGNIFICANT DIFFERENCES OF DIFFERENT COPING SKILLS OF THREE GROUPS (N=152)**

| Coping skills | Group | Mean % | SD | SE | Minimum % | Maximum % | F-value | p-value |
|---|---|---|---|---|---|---|---|---|
| Average coping skills score | Group A (Top 4) | 61.63 | 2.31 | 0.32 | 20.23 | 100.00 | 1.29 | .43 |
| | Group B (Middle 4) | 64.73 | 2.58 | 0.34 | 16.71 | 98.81 | | |
| | Group C (Bottom 3) | 60.54 | 2.29 | 0.34 | 22.61 | 97.61 | | |
| | Total | 62.30 | 2.39 | 0.33 | 19.85 | 98.80 | | |
| Coping with adversity | Group A (Top 4) | 64.50 | 2.34 | 0.33 | 25.00 | 100.00 | 1.04 | .36 |
| | Group B (Middle 4) | 67.25 | 2.19 | 0.29 | 25.00 | 100.00 | | |
| | Group C (Bottom 3) | 61.75 | 2.38 | 0.36 | 25.00 | 100.00 | | |
| | Total | 64.75 | 2.30 | 0.19 | 25.00 | 100.00 | | |
| Peaking under pressure | Group A (Top 4) | 59.00 | 2.58 | 0.36 | 8.33 | 100.00 | 1.42 | .25 |
| | Group B (Middle 4) | 65.33 | 2.97 | 0.39 | 16.67 | 100.00 | | |
| | Group C (Bottom 3) | 59.25 | 2.34 | 0.35 | 25.00 | 100.00 | | |
| | Total | 61.50 | 2.68 | 0.22 | 8.33 | 100.00 | | |
| Goal setting and mental preparation | Group A (Top 4) | 66.83 | 2.16 | 0.31 | 25.00 | 100.00 | .07 | .93 |
| | Group B (Middle 4) | 67.83 | 3.54 | 0.47 | 8.33 | 100.00 | | |
| | Group C (Bottom 3) | 66.08 | 2.25 | 0.34 | 33.33 | 100.00 | | |
| | Total | 67.00 | 2.77 | 0.23 | 8.33 | 100.00 | | |
| Concentration | Group A (Top 4) | 62.08 | 2.01 | 0.28 | 33.33 | 100.00 | .74 | .48 |
| | Group B (Middle 4) | 65.92 | 2.49 | 0.33 | 16.67 | 100.00 | | |
| | Group C (Bottom 3) | 61.92 | 2.36 | 0.36 | 25.00 | 100.00 | | |
| | Total | 63.50 | 2.30 | 0.19 | 16.67 | 100.00 | | |

***TABLE 5. (cont.)***

| Coping skills | Group | Mean % | SD | SE | Minimum % | Maximum % | F-value | p-value |
|---|---|---|---|---|---|---|---|---|

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Freedom from worry | Group A (Top 4) | 49.33 | 2.81 | 0.40 | 0.00 | 100.00 | .58 | .56 |
| | Group B (Middle 4) | 48.25 | 2.53 | 0.34 | 0.00 | 100.00 | | |
| | Group C (Bottom 3) | 44.42 | 2.75 | 0.42 | 0.00 | 100.00 | | |
| | Total | 47.50 | 2.68 | 0.22 | 0.00 | 100.00 | | |
| Confidence and motivation | Group A (Top 4) | 73.83 | 2.31 | 0.32 | 33.33 | 100.00 | 4.40 | .01* |
| | Group B (Middle 4) | 81.75 | 2.22 | 0.29 | 25.33 | 100.00 | | |
| | Group C (Bottom 3) | 70.67 | 2.55 | 0.38 | 16.67 | 100.00 | | |
| | Total | 75.92 | 2.40 | 0.19 | 16.67 | 100.00 | | |
| Coachability | Group A (Top 4) | 55.67 | 2.00 | 0.28 | 16.67 | 100.00 | .79 | .46 |
| | Group B (Middle 4) | 56.75 | 2.10 | 0.28 | 25.00 | 91.67 | | |
| | Group C (Bottom 3) | 59.67 | 1.45 | 0.22 | 33.33 | 83.33 | | |
| | Total | 57.25 | 1.90 | 0.15 | 16.67 | 100.00 | | |

Group A (Top 4 teams): n=53; Group B (Middle 4 teams): n=55; Group C (Bottom 3 teams): n=44.
*$p \leq 0.05$

## DISCUSSION

The purpose of the study was to investigate the relationship between psychological skills, playing positions and team performance of African youth soccer players. None of the analyses showed any statistically significant differences between the psychological skills scores of players in different playing positions. This finding is inconsistent with the results of other investigations (Kirkcaldy, 1982; Cox & Yoo, 1995; Sewell & Edmundson, 1996; Andrew *et al.,* 2007; Eloff *et al.,* 2011). Kirkcaldy (1982), for example, found that players in defensive positions in soccer showed higher emotional stability than players in attacking positions.

The fact that the current study failed to concur with other investigations could be explained by the elite level of participation of the sample tested in the present study. The comparative studies focused on provincial and less elite intercollegiate or tertiary level participants. The results of the present study suggest that youth soccer players competing at an international

level are homogeneously psychologically skilled regardless of their respective position in the team. This finding, pertinent to soccer players, is corroborated by Kurt *et al.* (2012), who credited such homogenous results to the similar status (amateur/professional) of the participants.

Another probable reason for the inconsistency between the current findings and those stemming from earlier research is the young age of the participants. McCarthy *et al.* (2010) postulated that young sport participants have less approximations of psychological skill usage compared to adult participants. Nearly half (47.3%) of the sample in the present study was 14 to 16 years old, which could attest to the insignificant relationship noticed between psychological skills and playing position. Holland *et al.* (2010) support this view by conceding that athletes in the specialisation stage (approximately 13 to15 years of age), may be at the ideal 'window of opportunity' for developing adult-like attributes and should, therefore, not be compared to older athlete groups. The mere fact that the instruments employed in this investigating was not standardised within the African context, may also explain why the results deviate from previous findings.

Further analyses revealed that players from the top four teams scored higher than the players from the bottom three ranked teams for *concentration* only. These results do not fully correspond with the majority of similar psychological studies done on soccer players. One such study by Coetzee *et al.* (2006), explicitly revealed that the most important discriminators between successful and less successful soccer players were goal directedness, concentration, optimal performance under pressure, achievement motivation, arousal control and goal setting. The fact that the top four teams outscored the bottom three teams regarding concentration ability only is, moreover, noteworthy.

The importance of concentration is emphasised in the literature, with some commentators believing that athletes who can focus on the task-relevant cues and avoid distractions are more likely to excel (Perry, 2005). The importance of concentration as the number one psychological skill for success was emphasised by Moran (1996:72), who concluded that "concentration skills are vital prerequisites of success in sport and concentration may be the most dividing factor between successful and non-successful athletes".

Another interesting finding regarding the psychological skills is the fact that players from the middle four teams recorded significantly higher scores in *relaxation* ability than did the players from either most successful or least successful teams. A possible explanation for this finding could be that the middle four team participants perceive themselves less likely to either win the tournament or to end among the bottom tier. In other words, they experience fewer anxious emotions linked to the value of relative success or failure (Cratty, 1973). In contrast, the top teams and the bottom teams might have recorded lower relaxation ability as they experienced more pressure to win the tournament or not to end last, respectively.

Further analysis revealed that the players in the middle group recorded higher *imagery*, *confidence* and *motivation* scores than the bottom group. This might be due to psychological properties related to high relaxation ability or to other factors that were not included in the scope of the present investigation. What is surprising is that there was no difference in these skills between the most successful and least successful teams. This could urge future

investigations to evaluate and compare the background knowledge and exposure to

psychological skills training amongst African youth soccer players. Whitley (2002) emphasised the importance of publishing research that is contradictory to the hypotheses. He also reiterates the important point that contradictory results (null results) must not be perceived as sources of disappointment, but rather sources of information that must be incorporated into the scientific knowledge base. However, since all possible variables which could explain the observed findings cannot be justified, it will be important that future studies examine the role of other intervening factors, which could account for such surprising similarities in the psychological qualitiesof successful and less successful teams.

## CONCLUSION

The results of this study could not confirm the established research findings that positional differences regarding psychological skills exist in team sports. It could be that psychological skills are unrelated to playing positions in maturing players or players competing at an international level. The argument that concentration is one of the most important psychological skills in sport, and may be the decisive factor in determining global soccer success, is supported by the findings of this study. No other mental skill differences relating to team success were, however, recorded between the ranked teams. In a sense, these findings raise the question of whether or not proper and adequate psychological skills training are implemented among young African national soccer players.

This study cautions researchers not to underestimate or overestimate the importance of psychological skill levels in sport and particularly playing positions, but to adopt a realistic perspective regarding psychological skills, especially in different age groups. Team sport is more complex than individual sport and multivariate analyses which include data on athletes' needs, developmental level, environment and sport specific skills should be used as baseline reference points for developing and categorising young players. Such an approach is supported by Weinberg and Gould (2011), who believe that sport participants should not be selected solely on their sport psychological profiles, but rather on their overall performance. Physique, strength, speed and skill levels should remain the primary determinants for selecting team members (Cox & Yoo, 1995).

Limitations of the study were the potential language barrier of instruments used, and failing to determine the knowledge and previous exposure of the participants regarding psychological skills training. Future research among African soccer players should also investigate their perceptions of psychological skill usage for the purpose of self-improvement in soccer, as well as the effect of psychological skills interventions on overall team performance.

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## PROCESS MODEL TO IMPLEMENT ORGANISATIONAL TEAM

# SPORT INTERVENTIONS IN AN ORGANISATION

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***ABSTRACT***

*A number of studies have been conducted on the benefits that organisational team sport interventions have for the employees and the organisation, but no formal studies were conducted on the implementation of these interventions in an organisation. The purpose of this research was to compile a process model for the implementation of organisational team sport at organisations. The qualitative exploration study was conducted with 63 sports participants and nine sports coordinators from nine different financial organisations in the Gauteng region. The data were collected by means of focus groups and individual interviews. The results indicate that the implementation process starts where top management initiates sporting activities and makes the employees aware of sporting events. The employees need to be informed through induction, presentations, electronic mail, sports competitions among different departments and videos. The employees' interest in the type of sport needs to be determined. Different sport managers or sport committees appointed for the different sports will be responsible to make known the different events, coordinate training sessions and events, and draw up annual budgets. Various sports facilities need to be established. The findings should contribute valuable new knowledge on the process model to implement organisational team sport in an organisation.*

**Key words:** Organisational team sport for employees; Implementation process model; Communication; Productivity.

## INTRODUCTION

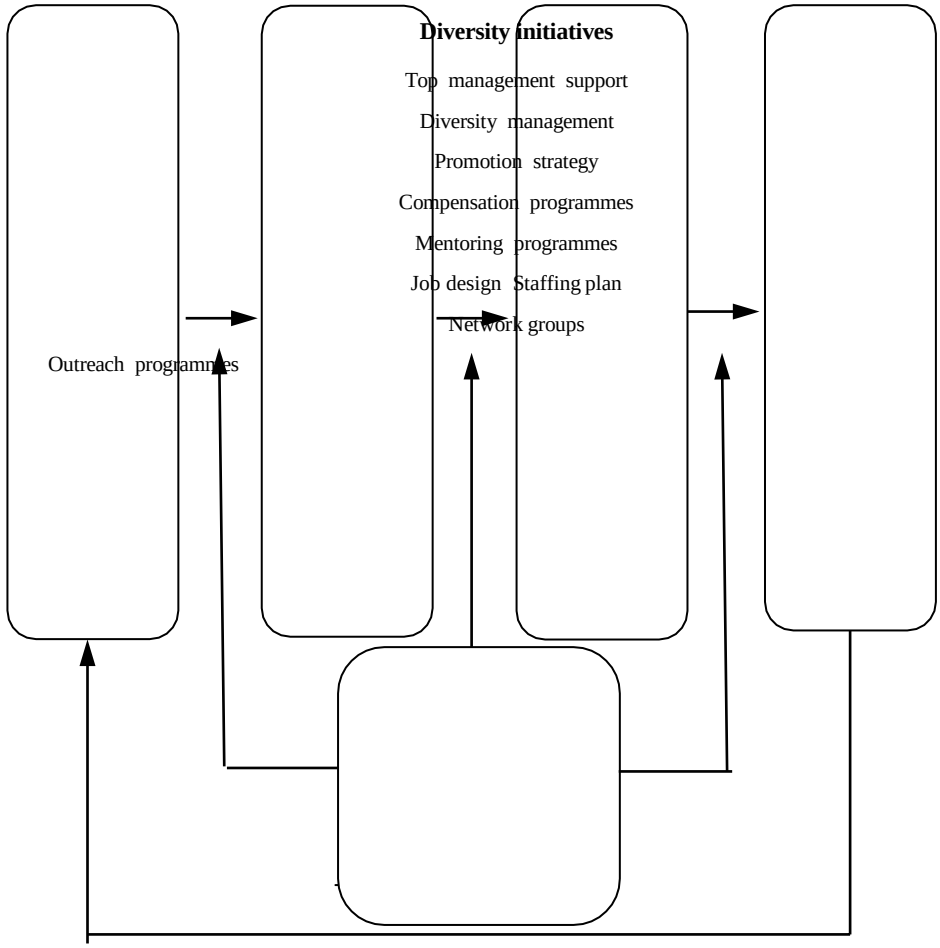
Some studies have been conducted to determine the positive effects that organisational team sports have on an organisation. The advantages are that participation in organisational team sport affords an employee the opportunity to share common visions and goals (Cashmore, 2003), creates individual commitment (Joubert & de Beer, 2011), advances cohesion in a team (Joubert & de Beer, 2011), advances mutual trust and respect among employees (Joubert & de Beer, 2011), creates open communication between employees (Chandler, 2006), advances employees‟ familiarity and thus relationships with other employees (Sawer, 2007), increases self-esteem (Chandler, 2006) and enhances the workplace culture, productivity and morale (Chandler, 2006). Therefore it is clear that organisational team sport interventions hold benefits for the employees in an organisation and for the organisation itself. However, no research has been done regarding the process that needs to be followed to

implement organisational team sport interventions in an organisation. or the purposes of this article, organisational team sport interventions are defined as a specific encouraged activity of workers in a certain organisation, designed for them to work together to achieve various goals and participate together in organisational team sport.

## LITERATURE SURVEY

Many change models and theories have been developed and acknowledged by a number of chief executive officers, training specialists, diversity consultants and academics (Ivancevich & Gilbert, 2000). The emphasis in this study is on the development of a process model to implement organisational team sport interventions in an organisation. It is therefore necessary to explain and discuss the different change models.

**Input-output systems model** (Ivancevich & Gilbert)



**Primary dimensions** (generally observable)

Race Ethnicity Nationality Gender Age
Physical capability

**Secondary dimensions** (generally observable)

Values Personality Attitudes Religion Educational level Job tenure

**Consequences (personal)**

Loyalty to firm  Commitment

Interaction  adjustment

Role ambiguity  Group identity  Anger

Self-efficacy

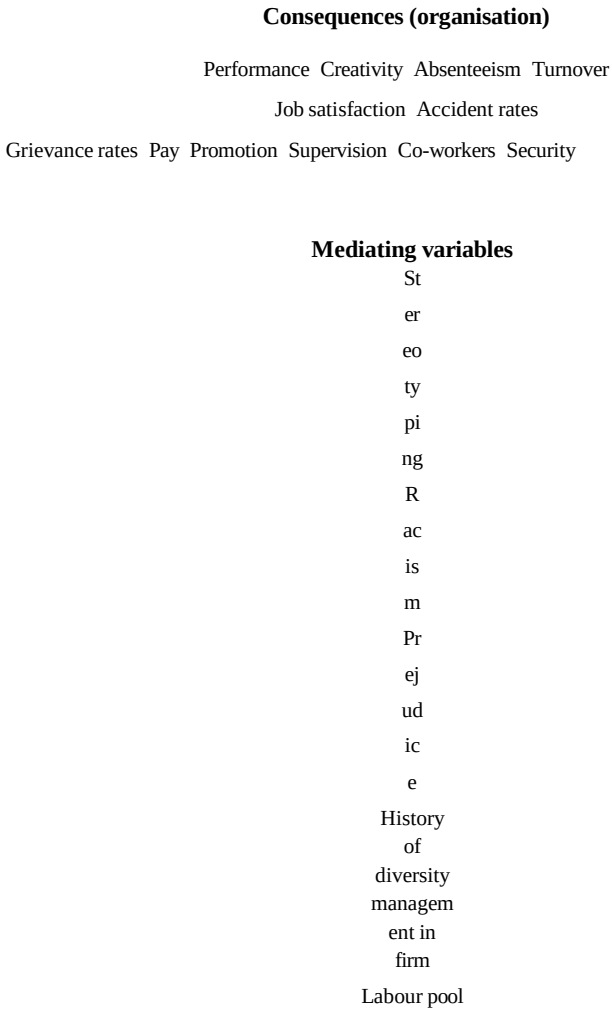



***FIGURE 1*: INPUT-OUTPUT SYSTEMS MODEL** (Ivancevich & Gilbert, 2000:78)

According to the input-output system approach developed by Ivancevich and Gilbert (2000), an effective initiative influences the personal and organisational outcomes. Figure 1 indicates that management initiatives (inputs) such as top management support, diversity management training, implementation of promotion strategies, compensation, mentoring and outreach programmes influence personal consequences (outcomes), which include the employees‟ loyalty towards the organisation, an increase in commitment, less anger and group identity.

The inputs will also lead to organisational consequences, such as higher creativity, lower absenteeism and turnover, increased levels of job satisfaction and better performance (Ivancevich & Gilbert, 2000; Stockdale & Crosby, 2004). The model further indicates that the surface-level, namely primary dimensions (differences in

employees‟ ethnicity, gender, physical capabilities, age, race and nationality) and deep-level/secondary dimensions (differences in the employees‟ religion, personality, values, attitudes, job tenure and educational level) contribute as inputs to the systems model. The mediating input variables may include the organisation‟s history, stereotyping, prejudices, diversity management and racism (Ivancevich & Gilbert, 2000; Stockdale & Crosby, 2004).

The main contributions of the input-output systems model are as follows (Ivancevich & Gilbert, 2000):

- It identifies and simplifies the actions (input) required to effect change.
- It postulates that what the organisation puts into interventions will be visible as results or outcomes. What does not go in cannot effect change and provide results.

The relevance of the model for this research is that a team sport intervention is regarded as an input into the organisation. If correctly applied, it should have consequences at a personal and an organisational level.

**Three-Spaces Model**

The *Three-Space Model* (De Beer *et al.*, 2008) differentiates between three physical and psychological areas in which change and learning takes place. It facilitates a process where mutual trust, respect and tolerance can develop in the workplace (De Beer *et al.*, 2008). The model has been developed on the following premises:

- Positive attitudes towards change can be developed through the progression of a positive personal influence in the first space, through the second space and lastly the third space.
- The three spaces in this model can be distinguished but not completely separated.
- My space is continuously developed by development in the second and third space.

Interventions and development need to take place in all three spaces for an individual or group to reach an advanced stage of acceptance and comfort with change. Development of these three spaces will also result in a high level of mutual tolerance, respect and trust between individuals and groups. This model (Figure 2) is based on the system approach.

***First-space*** *(intrapersonal space)*

The first space refers to a person‟s intrapersonal or mental model of beliefs, attitudes, prejudices, stereotypes and views about every aspect of oneself, others, the organisation and

how the world works. In order to unify a workforce, the individual‟s orientation and commitment to working in mixed groups should be addressed. If an employee is highly committed and is tolerant, cooperative, respectful and trusts his/her fellow employees from the onset, he/she are more likely to overcome change barriers. Commitment towards change is usually low at the onset of an intervention due to negative mental models, such as prejudices, stereotypes and ethnocentrism.

**Participation in organisational team sport**

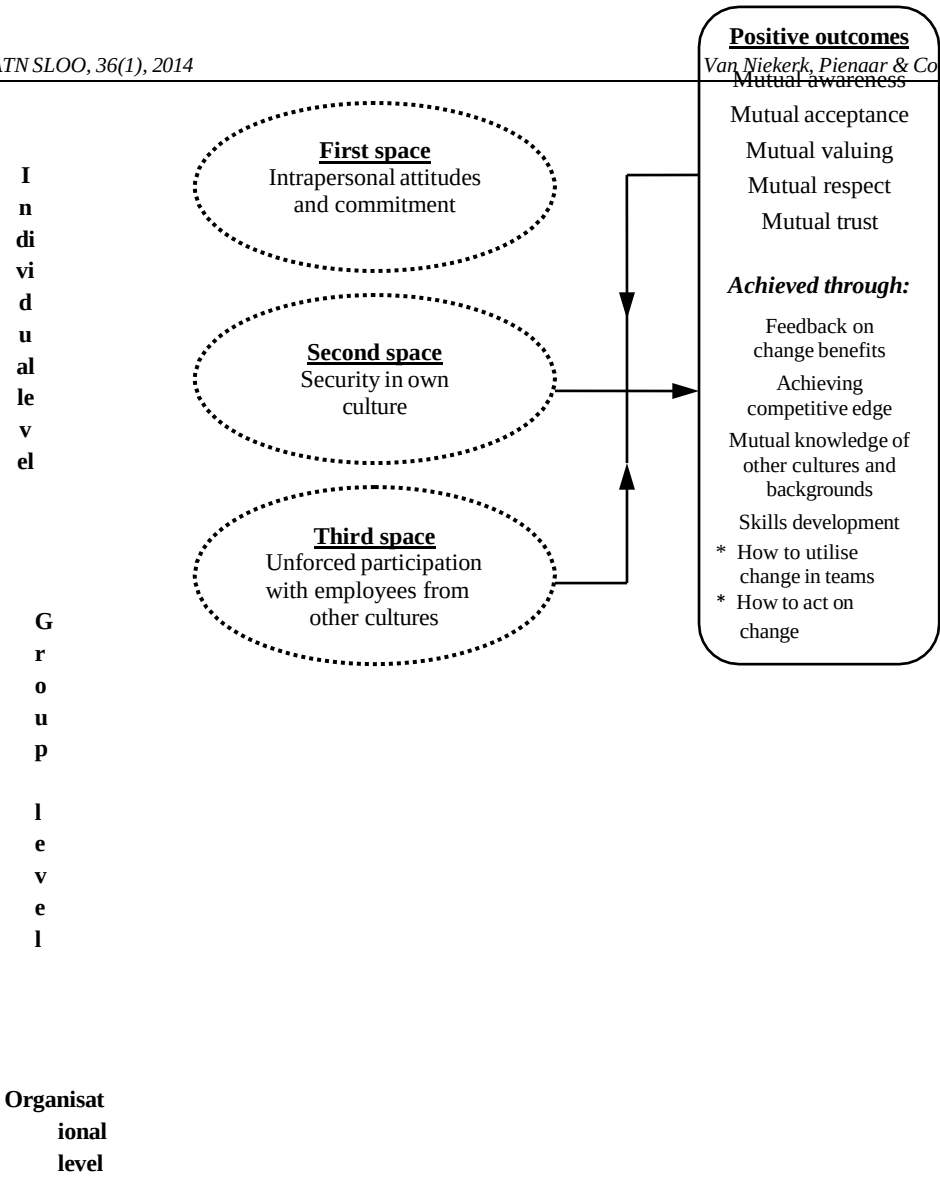



***FIGURE 2*: THREE-SPACES MODEL** (Adapted from De Beer *et al.*, 2008:1-4**)**

***Second space*** *(own space)*

The second space is the unique space or personal identity of an individual or own group, such as own national culture that includes language, religion, customs, food preferences, etc. De Beer *et al.* (2008) argues that if a person knows who he/she is, is familiar with his/her own culture, knows where he/she comes from, then only will sufficient security towards change develop. People who have developed a distinct own cultural identity of which they are proud, are, according to De Beer *et al.* (2008:3), not afraid to explore change due to the fact that they "lose their fear of losing their identity".

***Third space*** *(other space)*

The third space states that contact with employees from different cultural backgrounds diminishes prejudice towards people from different cultural backgrounds. The third space should be utilised in such a way that every employee should make contact with employees

from other cultures in the latter‟s second space. Sport interventions create optimal contact in a neutral environment or third space where prejudice can be reduced.

***Connecting organisational team sport interventions with the Three-Spaces Model***

The main reason why different ethnic groups do not mix is not because they do not want to, but because they have no reason to (Volet & Ang, 1998). Organisational team sport presents employees this unique opportunity to develop relationships across different cultures in a relaxed climate (space) of mutual trust and commitment. Organisational team sport is therefore a unique vehicle for effective change in an organisation. It is a relatively low-cost means of bringing together disparate socio-economic, gender, ethnic, language, hierarchical and religious groups, on a basis of shared rules and mutual respect (Prescott & Phelan; 2008). According to the findings of previous research done by Chandler (2006), Sawer (2007) and Joubert and De Beer (2011), organisational team sport is an effective method to redesign employees‟ negative mental models and to successfully change it to a model where effective cooperation among employees from different backgrounds is supported within the organisation.

Organisational team sport can provide structure in a process where mutual respect, trust and tolerance can be developed. Sport interventions, in the light of the Three-Spaces Model, can provide this inimitable space of three practical learning areas in which learning and change can and must take place for effective diversity, education and unity in organisations (Joubert & De Beer, 2011).

**Change Dynamics Model**

| | |
|---|---|
| **Unfreezing stage** ↓ | Top management vision and commitment<br>Management communication and actions<br>Goal-setting |
| **Moving stage** ↓ | Recruitment and outreach programmes<br>Co-op and internship programmes<br>Training and education<br>Mentoring and career development |
| **Refreezing stage** | Policies and procedures<br>Job descriptions<br>Reward systems |

| | |
|---|---|
| **Outcome: competitive advantage** | Improved creativity and decision making<br>More agile and adaptive work force<br>Improved ability to market to a broader demographic<br>Increased market share |

***FIGURE 3*: CHANGE DYNAMICS MODEL** (Allen & Montgomery, 2001:155)

Allen and Montgomery‟s (2001) *Change Dynamics Model* is relevant to this study because it emphasises the dimensions of the change during the implementation of organisational team sport interventions in an organisation. The *Change Dynamics Model* explains the implementation of a behavioural change in an organisation so that the implementation of organisational team sport intervention can be successful.

This model, as shown in Figure 3, indicates that during the „unfreezing phase‟ the organisational environment changes and forces an organisation to change. There might be forces to resist change that the organisation needs to overcome. Management intervention becomes important during the unfreezing phase and managers start with the process by unfreezing the current culture in the organisation. This could be achieved by contributing to changing the systems and sufficient resources in which the organisational culture operates.

During the „moving phase‟, programmes, training and education, mentoring, recruitment, career development and outreach are implemented. During the „refreezing phase‟, which is the crucial final phase, the organisation aims to gain the most benefits from the new intervention. It is important that management of the organisation ensures that the changes are institutionalised during the last phase. The organisation‟s procedures, policies, strategies and rewards system must be linear with the new culture in the organisation. If this final phase is not in place, the organisation will run the risk of falling back to its previous culture. This stage begins by reviewing existing strategies, policies and procedures and to make sure that it supports the new culture in the organisation.

## PURPOSE OF THIS STUDY

This study follows on the studies of Chandler (2006), Joubert and De Beer (2011) and Sawer (2007) by also exploring the benefits of organisational team sport in organisations. The purpose of the study reported in this article was to compile a process model for implementing organisational team sport at an organisation. The experiences that the sport coordinators and employees have with regard to the implementation process of organisational sport activities were determined to enable developing a process model to implement organisational team sport interventions at an organisation.

## RESEARCH DESIGN

### Research approach

A qualitative approach to research was used in this study, to explore major themes by

listening and understanding the participants‟ and sport coordinators‟ views and perceptions. The participants can provide a rich and descriptive account of their understanding of the aim of this study because they participate in organisational team sport. Guiding and probing questions were asked to gain insight into the participants‟ and sport coordinators‟ perceptions. The methods in this type of research focus on interpretations and meanings. The research method is very complex because how people act in certain situations must be understood (Rice & Ezzy, 2002).

Two theories were used to clarify and formulate the aim of this study. Firstly, a grounded theory approach was used in this study because of its organised approach towards listening and in order to gain an understanding of the participants‟ and sport coordinators‟ views and perceptions of their own beliefs, context and history. The goal of this theory is to collect and to analyse the data, after which assumptions can be made which is „grounded‟ in the data (Brink *et al*., 2006). Data was collected from the participants and sport coordinators who were working at different financial institutions and who participate in organisational team sport interventions. Secondly, a phenomenological approach was used because interviews were used to gain in-depth information based on the experience of sport participants‟ and sport coordinators‟ about the implementation process of organisational team sport interventions at their organisations.

**Population**

Participants from 9 financial organisations in the Gauteng region of South Africa were approached to be part of the study. The research population for this study comprised players participating in team sport, as well as sport coordinators working at financial institutions in the Gauteng region of South Africa. Nine different financial institutions were selected for this research. A sample of convenience was used because the participants were readily available.

**Sample**

A purposive participant technique was used to identify 63 sport participants for the focus group interviews and 9 sport coordinators for the individual interviews. The participants had to work for the financial organisations in the Gauteng region and participate in organisational team sport. The focus group interviews with the sport participants and the individual interviews with the sport coordinators were conducted to gather the required information to enable the researcher to achieve the research objectives. The information of the composition of the focus group with the sport participants and the individual sport coordinators are presented in Table 1.

***TABLE 1*: PARTICIPANTS**

| Organi-sation | Sport code | Male sport participants | Female sport participants | Sport coordinators | Total participants |
|---|---|---|---|---|---|
| 1 | Netball | - | 6 | 1 (male) | 7 |
| 2 | Cricket | 4 | 3 | 1 (male) | 8 |
| 3 | Cricket | 5 | 2 | 1 (female) | 8 |

| | | | | | |
|---|---|---|---|---|---|
| 4 | Soccer | 2 | 4 | 1 (male) | 7 |
| 5 | Soccer | 3 | 3 | 1 (male) | 7 |
| 6 | Volleyball | 5 | 3 | 1 (female) | 9 |
| 7 | Cricket | 7 | - | 1 (male) | 8 |
| 8 | Cricket | 8 | - | 1 (male) | 9 |
| 9 | Soccer | 8 | - | 1 (male) | 9 |
| | **Total** | **42** | **21** | **9** | **72** |

**Data collection**

Because of the large quantity of data collected in this study, the qualitative data analysis software, Atlas.ti, was used to manage the data (Maclaran & Catterall, 2002). Atlas.ti is a code-based theory-builder designed to become an extension of the researcher (Babbie & Mouton, 2003). When there is a vast amount of qualitative data, the body of the data necessitates the use of a computer software program to analyse the data by means of coding and to present a visual model of the data based on emerging categories (Brown *et al*., 2002). In this study, the data of the focus group interviews were collected through tape recordings that were transcribed verbatim. The focus group interviews were transcribed in one-and-a- half spacing with wide margins to enable the researchers to make written comments and notes.

The focus group interviews with sport participants and individual interviews with sport coordinators were used to obtain a richer response. Focus group the participants knew one another and they were free to differ from the other participants and to give their own views and ideas during the interviews. The individual interviews were conducted with sport coordinators who made up a small sample of participants where each represented a single financial organisation. There were not enough sport coordinators from the same financial organisation to conduct focus group interviews. The individual interviews were conducted on the same basis and principles of the focus group interviews. A time was set for the focus group interviews and the individual interviews, which were conducted in a boardroom which was an undisturbed area at the participants‟ workplace. Each focus group interview took approximately an hour and the individual interviews took approximately 45 minutes to complete.

***TABLE 2*: FOCUS GROUP AND INDIVIDUAL INTERVIEW QUESTIONS**

| | Interview questions |
|---|---|
| 1 | In your experience, what benefits do organisational team sport interventions have for the organisation and the employees in the organisation? |
| 2 | In your view, what is the process that an organisation can follow to implement organisational team sport? |
| 3 | What are the functions of top management during the implementation of sport activities? |
| 4 | What can management do to make the employees more aware of the new sport interventions? |
| 5 | What can management do to determine the employees‟ interest in certain sport activities? |
| 6 | What are the responsibilities of a sport coordinator? |
| 7 | If a company is not aware of any facilities where they can play their sport activities, what action can they take? |

The focus group and individual interviews were semi-structured, because guided interviews consist of broad objectives that are reflected in guiding questions (Table 2), where participants are encouraged to describe their experiences and views in a particular situation and the interviewer is free to explore any matter that may arise (Grbich, 1999:93). A reliable tape recorder in a quiet environment was used during the interviews (Kvale, 1996). The researcher also compiled field notes that contained facts about the interviews, the interview setting and personal feelings and impressions. The questions put during the focus group and individual interviews to enable the researchers to collect the data for the study are presented in Table 2.

To develop a process model to implement organisational team sport interventions in an organisation, it was necessary to determine the need for organisational team sport interventions in an organisation and whether team sport does hold any benefits for the organisation and the employees in the organisation.

**Analysis of data**

The qualitative data (interviews) were analysed by making use of Tesch‟s content analysis method and Atlas.ti. The following steps (Tesch, 1990) were applied to identify the main code names: (1) the tape-recorded focus group interviews with the sport participants and individual interviews with the sport coordinators were transcribed. Notes were made as they came to mind; (2) the interview that was most interesting (in this research the researcher used the longest interview) was selected and the researcher wrote the ideas in the margin that serve as a starting point to identify the main codes; (3) the descriptive wording that occurred the most for the different topics was analysed and themes were created; (4) a list of all the different main topics was made and written on a separate piece of paper and similar ones were grouped together; (5) the different main topics were abbreviated and codes were allocated; (6) a final decision was made on the abbreviation for each main theme and the codes were alphabetised; (7) each main theme‟s data material was assembled and a preliminary analysis was done; and (8) the findings were then reported.

Atlas.ti is a code-based theory-builder designed to become an extension of the researcher (Babbie & Mouton, 2003). Atlas.ti was chosen because it allows for the analysis of textual, graphical and audio data (Muhr, 1994).

A combination of Atlas.ti and Tesch‟s (1990) method were used. Because of the large quantity of the data collected in this study, Tesch‟s (1990) method was applied initially to identify the code names (findings) for the study. The data was analysed using Tesch‟s method before any computer software programs (in this case Atlas.ti) could be used because these programmes do not analyse the data itself. The code names identified by applying Tesch‟s steps of analysis were inserted.

**Ethical consideration**

Focus group and individual interviews were conducted in a venue that ensured the comfort and privacy of the participants. For this a private boardroom was used where no, or limited, disturbances occurred. Another ethical consideration was to ensure that a written and informed consent of the participants and sport coordinators was obtained prior to their

participation in the study (Silverman, 2002). Focus group and individual interviews were conducted in privacy, and confidentiality was maintained by ensuring that the data were available only to the researchers. None of the employees at the financial organisations had access to the data. The data were stored at the researcher‟s office. The participants remained anonymous.

A qualitative study can be considered trustworthy when the research can be accepted as true (McNeill, 1990). To enable the readers of this article to determine whether the findings of the study are relevant to their personal circumstances, the information of the population is presented and the personal information of the participants and sport coordinators are provided. The trustworthiness was also enhanced because the researcher played a team sport for more than nine years and has personal experience of the benefits of organisational team sport interventions. It is acknowledged that these roles may have influenced the researchers‟ interactions with the participants (Finch & Lewis, 2005) and may ultimately have had some effect on the research findings. The ethical measures of self-disclosure were therefore used to address this potential bias. In this study, data saturation was experienced after participants of nine different financial organisations were interviewed.

## RESULTS

The data analysis revealed two main themes that relate to the implementation of organisational team sport interventions in organisations, namely: 1) the benefits of organisational team sport interventions for the organisation and its employees; and 2) the process that an organisation can follow to implement organisational team sport.

### Benefits of organisational team sport interventions for the organisation and its employees

To compile a process model to implement organisational team sport in an organisation, the experiences that the sport coordinators and employees had regarding

the implementation process of organisational sport activities were explored. The participants reported that the benefits of organisational team sport interventions for the organisations and their employees are: that they have learnt about one another; interpersonal communication has improved; they now know more about one another; they have become friends; there is more trust among the participants; there is more respect among the participants; organisational team sport interventions help them to work together as a team and towards the same goal; organisational team sport interventions improve client service in the organisation; they have overcome hierarchical barriers and the participants were of the view that there is stronger commitment among the participants. Representative responses were as follows:

*It basically helps people to understand each other and to be more tolerant. In our company we have currently action cricket, action netball, action soccer, action rugby, touch rugby and volleyball and in that we realise that if there is a manager who does not necessarily work with you every day and who doesn't make the effort to get to know you because you are from a different race and you are different from him obviously; but because you see him on the sport ground and you see him somewhere else in the workplace, the guys do get together because there is*

*something we have in common and something we both enjoy and we make the effort to say "hey, how do you do".*

*Although we are the same, you pick up different words and slang that you don't know in your own culture. Like we picked up "gees" and I didn't know what they were talking about. I learned different words in a different language and you are able to use it in a conversation and you are able to understand it. You feel comfortable within the environment. In every language we all have our own language and slang and now integrated in a team we all pick up on different things. Like when I play with white people I would say we "pick up gees", but if I play with black people I would say "Heita my friend". You learn about each other's culture and how they speak.*

*… And in that way, when you come to work it is easier to speak with them on another level – not so formal and you are more confident with them.*

*Because we play in the same team, we don't just walk past them, which is what we would have done if we had not played in the same team. We actually stop and start a conversation. Just to hear how it goes. We have always something to talk about, even if it was last night's game.*

*Well, it is basically bridging the gap, because if you are not certain about a certain type of person you would not know how to approach that type of person but by doing sports and actually having been with them on a different level, it help you to know that person socially or even on a business level.*

*You have fun and you start to know the people around you. You are not just working in your own department. You also learn the other people from the other departments.*
*… And it was through the interdepartmental challenge that I got to know my colleagues better.*

*We also became friends. We socialise before and after the game with the team players, so it is not just the game and go home, we spend time together.*

*We receive more funny e-mails from out team members because we are now friends.*

*Trust and respect are part of our values in the company. And a sports team will improve the trust and respect between people in our company because I know that if one of the girls tell me that they can't make it tonight, I trust them that something has happened and they don't just make excuses. I also send an e-mail out once and I trust that the players will all be here on time for the game. You also trust your team players that they will catch the ball if you throw it to them.*

*The fact that we are all equal in the sports team, we bring it back to the workplace. We are all here for the same goal which is to win. We work together towards the same goal. We are all the same if we are on the court.*

*A positive thing is that when you make a mistake in the team you want to improve. We work towards a common goal and when a problem happens we know how to deal with it. We all make mistakes and we learn from each other.*

*And when people are committed in their work and they learned to work towards a goal, they will also be able to work in a group at the organisation and reach the organisational goals. Everybody can bring individual input to the team which can help make the team better and achieve its goals.*

*It is basically establishing a network base in the company – if you want something to be done quickly you can go to your sport buddy in any department.*

*It also helps us to have a relationship with different levels for instance management because in sport we all play in the same team. It doesn't matter if you are a junior or a senior.*

*In sport you learn to be committed – be on time for the games and bring your best – and a company also requires you to be committed.*

After the information regarding the benefits of organisational team sport interventions for the organisation and their employees was collected, questions could then be asked that would contribute to developing a process model to implement organisational team sport interventions at an organisation.

**Process for an organisation to follow when implementing organisational team sport**

Participants in this study reported that the implementation steps for organisational team sport interventions in the organisation are as follows: get commitment from top management, advertise/make employees aware, determine employees‟ interest, appoint a sport manager/sport coordinator and provide facilities. The respondents mentioned the following:

*Ensure management is involved and adequate marketing is done to promote this.*

*Top management must be involved and aware that there is a need for sport*

*in the organisation and you need to get approval from top management.*

*They can advertise it on their intercom, or even advertise it in the company's magazine, if they have something like that.*

*The senior manager is part of marketing and he has been given a mandate to communicate to everybody in the company to market the games. He sends out the e- mails to all the employees.*

*They can send out a questionnaire where the employees must tick whether they are interested in sport and what sport they want to participate in. They can send that questionnaire through e-mail.*

*After that they can send out questionnaires to all the employees or send e-mails and the employees must respond to the e-mail stating their interest in which sport activity.*

*Then a person needs to be appointed that is the head of a certain sport activity, for instance, cricket or netball …*

*A sport committee must be formed to drive participation.*

*Then they can contact sport clubs and ask them whether they can start playing there.*

*If you start, for instance, hockey, you need facilities – hockey facilities are needed to host these games. Then you just start from there, you enter your league and you go.*

The following sub-themes derived from the process that an organisation can follow to implement organisational team sport: (1) functions of top management; (2) management"s actions to make employees aware of the new sporting activities in the organisation; (3) actions that management can take to determine the employees" interest in the new sporting events; (4) responsibilities of a sport coordinator; (5) actions that a company can take to find possible sport facilities.

**Functions of top management**

Participants indicated that the functions of top management during the implementation of sport interventions are to act as an initiator and to make employees aware of the new sporting activities, for example:

*I think that the management must initiate it.*

*The managers must start and drive the sport activities.*

*… when the management is involved, they can start making the employees*

*aware. They must make each and every department aware of the sports.*

**Actions from management to inform employees about new sporting activities in the organisation**

Participants generally agreed that the management"s actions to make employees aware of the new sporting activities at the organisation are through induction/orientation, presentations, e- mails, departmental competition and videos.

They reported that:

> *I think it has to start from top management and they must make the people aware of the sport through induction …*
>
> *During orientation the company can make the employees aware of the sport.*
>
> *I remember, before I started participating in the sport event, our company had a presentation about the sport club.*
>
> *They must make each and every department aware of the sports by sending the manager of every department an e-mail and they must distribute it to their subordinates.*
>
> *Then the sport managers must make the employees aware that the organisation is going to start a sport club – they can advertise it through billboards and e-mails.*
>
> *Competing between the different departments as a team-building thing to get everyone else involved.*
>
> *To make the employees more aware of the sport activities they can show a video.*

**Actions by management to determine the employees' interest in new sporting events**

The participants agreed that the actions that management can take to determine the employees" interest in the new sporting events are to send out surveys or questionnaires. Below are some excerpt responses in this regard:

> *Before the sport managers are appointed, top management must first send out the surveys to determine who wants to participate in what type of sport.*
>
> *Maybe top manager or sport managers can send out surveys to determine whether there is a need for a certain type of sport.*

**Responsibilities of a sport coordinator**

The participants were of the view that the responsibilities of a sport coordinator are to act as the head of the sport activities, coordinate the sporting events, draw up an annual budget and communicate the sporting events to employees/teams. The participants mentioned the following:

> *Or they can appoint a sport manager who handles these administrative tasks. They can appoint a sport manager for each type of sport, that is, cricket, soccer, netball.*
>
> *… that is the head of a certain sport activity – for instance, cricket or netball.*
>
> *They must organise sport events, see to it that the employees know what time their games start, make sure that the games are paid for.*
>
> *They also need to draw up a budget every year of how much money is needed to do the sport.*
>
> *… he is responsible for the communication between the employees. That person needs to have the passion.*

*... and they must communicate all the events with the teams.*

**Actions by a company to find sport facilities**

The participants reported that the actions that a company can take to find possible sport facilities are through research on the internet and word of mouth, for example:

*Maybe on the internet. I'm sure the different sport clubs advertise themselves on the internet. Or maybe in magazines, although I have never seen an advert of a sport club advertising itself in a magazine.*

*I'm sure they can search on the internet ...*

*Or they can speak to other organisations that are already participating in sport events and find out where they can find such a sport facility.*

*We got this facility through word-of-mouth.*

## DISCUSSION

The results suggest that the participants have specific views regarding the implementation process of organisational team sport interventions. The steps identified from the research results include: (1) top management needs to initiate the sporting activities in the organisation. The functions of top management (question 3) are to act as an initiator of the new sporting events; (2) the employees need to be made aware of the new sporting activities in the organisation. Methods (question 4) such as induction/orientation, presentations, E- mails, departmental competitions or videos can be used to make employees aware of the new sporting activities; (3) top management needs to determine the employees‟ interest in the different sporting events.

A survey or questionnaire could be sent to the employees to determine their interest in the different sporting activities (question 5). The employees need to respond to it and return it to top management to enable them to ascertain what sporting activities the employees are interested in; (4) different sports managers/sports coordinators need to be appointed for the various team sport activities.

The sports coordinator will act as the head of sports activities. This person needs to communicate all the events with the participants and to coordinate the sporting events, and to also be responsible for drawing up a annual budget showing how much money is needed for the sports events (question 6); and (5) it is also the sports manager‟s responsibility to find appropriate sporting facilities where the sports events could take place. The sporting facilities could be found through research on the internet or by word of mouth (question 7).

The participants‟ perceptions support the views of Allen and Montgomery‟s (2001) change dynamics model (Figure 3). They are of the view that during the unfreezing stage top management initiates an action to the employees (Step 1 of the implementation process). During the moving stage, the company must start with their recruitment and outreach programmes (Step 2 of the implementation process). The refreezing stage procedures must be implemented (Step 3 of the implementation process).

The experiences that the sport coordinators and employees had with regard to the implementation process of organisational sport activities were also explored by implementing the Atlas.ti method of analysis. From the participants‟ experiences, the process model identified using Tesch‟s model was extended. Using the Atlas.ti, an extended process model emerged on how to implement an organisational team sport project in organisations for maximum effectiveness. The extended implementation process model for organisational team sport interventions was identified by using the Atlas.ti method (Figure 4).

The participants‟ views regarding the implementation process (questions 2, 3, 4, 5, 6 and 7) were used to create this model. It was concluded that when an organisation wants to benefit from organisational team sport interventions it has to implement these initiatives successfully. The final process model to implement organisational team sport in an organisation developed is presented in Figure 5.



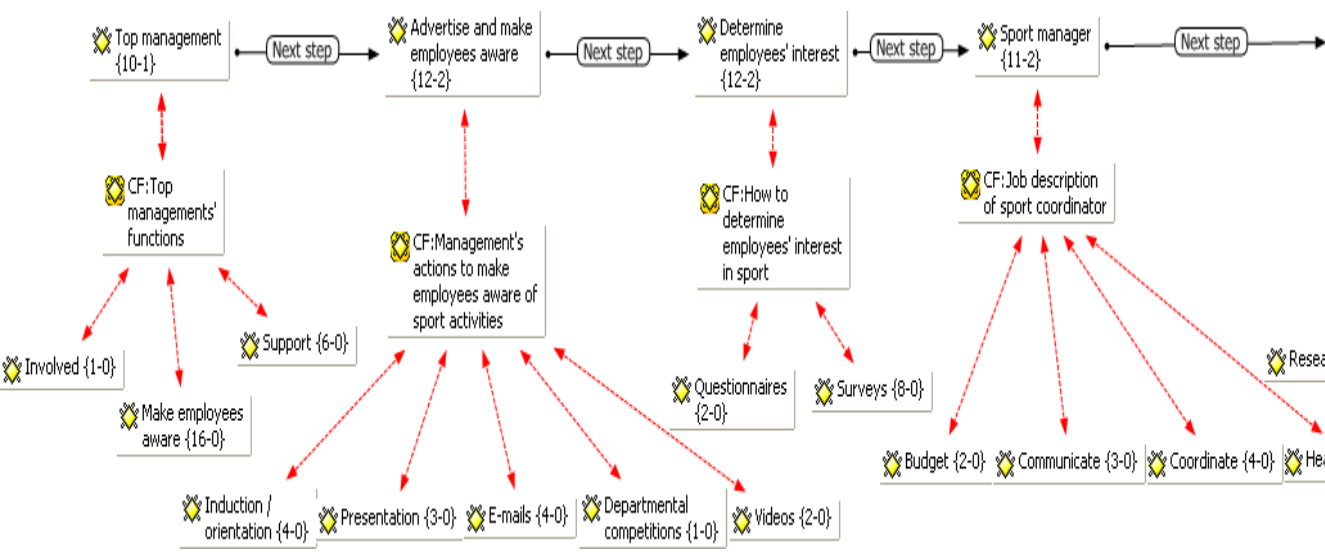



***FIGURE 4*: IMPLEMENTATION PROCESS MODEL FOR ORGANISATI**

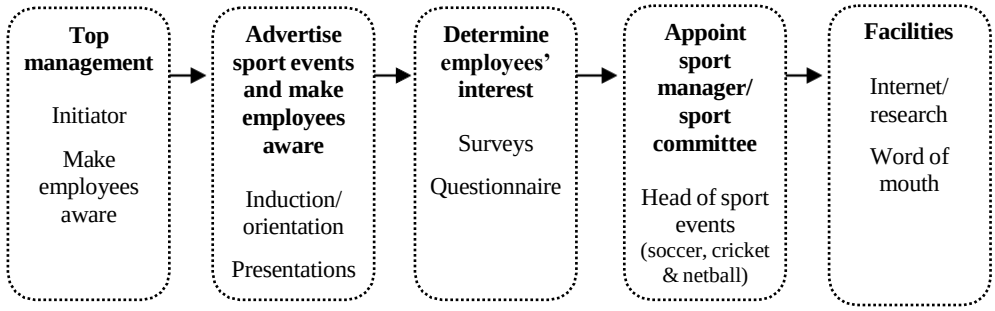



***FIGURE 5*: SUMMARISED PROCESS MODEL TO IMPLEMENT TEAM SPORT IN AN ORGANISATION**

## CONCLUSION

The objective of the reported study was to compile a process model to implement organisational team sport in an organisation. The experiences that the participants had with regard to the implementation process of organisational sporting activities were explored. When an organisation desires to benefit from organisational team sport interventions, it has to implement these initiatives successfully. The focus of this study was on the employees who participate in organisational team sport interventions and the sport coordinators in nine financial organisations. Only personnel of financial organisations in the Gauteng region, South Africa were interviewed. Other organisations in other regions should also be considered in further studies.

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## REFLECTING ON INDUSTRY AND STUDENT EXPECTATIONS FOR WORKING IN THE TOURISM AND HOSPITALITY INDUSTRY: A CASE STUDY

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***ABSTRACT***

*The tourism and hospitality industry faces major challenges of which a shortage of professional industry-related skills is probably the most pronounced. Added challenges include recruiting and retaining staff within an industry that is intensely service-driven and customer-oriented. Staff should be suitably qualified and able to cope with the challenges of being service workers. It is thus vital that students who study or intend to study Tourism and/or Hospitality Management should be adequately informed about industry's expectations and challenges, as well as the demanding work environment they can expect once they are employed in the industry. It is also imperative that industry stakeholders clearly articulate what is expected from graduates once they are employed. As there is often a mismatch between what the students and industry expect from each other, the aim of this paper is to address the expectations of both industry stakeholders and students. The study was conducted in the Bloemfontein area of South Africa and respondents included the Tourism Management and Hospitality Management students of the Central University of Technology, Free State (CUT), and selected industry stakeholders. The findings underline the importance of management/technical and people skills in an extremely demanding and labour-intensive industry.*

**Key words:** Student expectations; Industry expectations; Tourism and hospitality industry.

## INTRODUCTION

The recent global economic crisis has placed a huge strain on consumer spending worldwide. It is, however, encouraging to note that international tourism to South Africa has grown by 3.3% to 8 339 354 in 2011 (Lamprecht, 2012). In 2012, 9.19 million international tourists visited South Africa, which is 10.2% more than in 2011 (Smith, 2013). Travelling by local tourists has also increased from 13.5% to 13.9%, which supports the notion that tourism can invigorate the economy of countries and local regions (Lamprecht, 2012). Apart from creating much needed job opportunities, the South African tourism industry contributes R65.4 billion to the Gross Domestic Product (GDP). The hospitality sector is the largest within the tourism industry and employs around 77% of the employees working in the industry (THETA, 2010). Due to the size and scope of the hospitality sector it could be regarded as an industry; hence the term tourism and hospitality industry will apply to this paper.

The influx of international and domestic tourists continuously creates new job opportunities which increase the demand for professionally trained staff in the industry (Jugmohan, 2010). The demand for more professionally trained staff, however, exceeds the supply and the Solidarity Research Institute (2008) reported on skill shortages in South Africa has already indicated that the hospitality industry is suffering from a serious skills deficit, which includes a critical shortage of managers. Skills shortages are not the only problems the industry face. Literature indicates that there are persisting challenges pertaining to talent management, employee retention, job satisfaction and morale (Chiang *et al*., 2005; Deery, 2008; Maxwell

& MacLean, 2008; Maier, 2009). The situation is further complicated by persisting negative perceptions about working in the industry. Wood (1997) assessed documentation dating from the 1970s, 1980s and 1990s and reports that hospitality work is regarded as "largely exploitative, degrading, poorly paid, unpleasant, insecure and taken as a last resort" (Wood, 1997:1). This corresponds with the notion that the tourism and hospitality industry are synonymous with employing low skilled workers (Shaw & Williams, 1994; Westwood, 2002; Solnet & Hood, 2008).

Considering the size and scope of the tourism and hospitality industry, as well as its positive contribution to job creation and the economic upliftment of both rural and urban communities, the industry cannot afford not to employ suitably qualified employees (Maumbe & Van Wyk, 2011). Universities are usually tasked with providing suitably qualified employees to business and industry and one way of doing this is to clarify what industry expects from graduates and vice versa. Students that study or intend to study Tourism and/or Hospitality Management need to be adequately informed about the inherent challenges associated with working in the industry. This includes the hectic working conditions and long work hours associated with working in the industry. A troubling finding is reported by two recent studies, one in the Malaysian and the other in the Australian context (Richardson, 2009; Richardson & Butler, 2011), namely that Tourism and/or Hospitality Management students do not regard a career in the industry as a viable option. Reasons cited were work-life conflict due to long and hectic work hours and relationship problems between employees and managers. A study by Chuang (2011) confirms these reasons but also adds poor financial compensation and a lack of opportunities for career advancement to the list of challenges.

Providing suitably trained employees to business and industry is an on-going concern for universities and it is imperative that the skills universities impart to students are in juxtaposition of what industry requires (Kokt *et al*., 2012). This investigation focuses on the Central University of Technology, Free State (CUT), one of six Universities of Technology (UoTs) in the South African context. UoTs dove-tail theory and practice in providing business and industry with applicable work place skills and innovation-oriented, applied research (Moraka & Hay, 2009). Both Tourism Management and Hospitality Management students at CUT are exposed to working in industry (through Work-integrated learning - WIL) and with the community (through service learning). WIL is used as an umbrella term to describe curricular, pedagogic and assessment practices across a range of academic disciplines, as students are exposed to working in business and industry (CHE, 2010). Whereas service learning is a pedagogical practice that integrates service and academic learning to promote increased understanding of course content, while helping students develop knowledge, skills and capacities to deal effectively with problems (CHE, 2010).

Tourism students have six months WIL exposure and hospitality students twelve months. Both Tourism Management and Hospitality Management students have six months service learning exposure.

Taking into consideration the skill shortages that plague the industry it is imperative that the training provided to prospective entrants are current and what industry requires. The study thus reports on a fundamental issue that impacts the longevity and sustainability of the tourism and hospitality industry. The research methodology comprised of a quantitative research design and data was captured by means of two structured questionnaires – one

administered to all undergraduate Tourism and Hospitality students at the CUT and the other to selected industry stakeholders in the Bloemfontein area. Although the use of one UoT could be viewed as a limitation, the findings nevertheless provide useful insight into the expectations of industry and students, alike.

## GRADUATE SKILLS FOR WORKING IN TOURISM AND HOSPITALITY INDUSTRY

As indicated before, recruiting and retaining suitably qualified graduates are a major concern for the tourism and hospitality industry. Shortages in skilled staff are reported in both the South African (THETA, 2010) and international (Ricci, 2010; Richardson & Butler, 2011) arenas. Blomme (2006) reported that up to 70% of graduates leave the industry within six years after graduation, while Chuang (2011) estimated the drop-out rate to be between three and five years. Also, it is estimated that each case of staff turnover – especially on management levels – costs in the vicinity of R240 000 (£20 000) (Lamprecht, 2012).

A successful career in the tourism and hospitality industry involves the mastery of certain critical skills. A career can be described as the work-related experiences that span an individual‟s lifetime and a skill is a learned capacity to carry out a particular action (Noe *et al*., 2008). A variety of research studies have been conducted on graduate skills in the tourism and hospitality industry. Knutson and Patton (1992) identified human resources skills and the ability to interact with guests as the most crucial skills applicable to tourism and hospitality work. In later years the importance of people management skills (or „soft skills‟) was highlighted – particularly interpersonal skills, leadership skills, problem-solving skills and decision-making skills (Nelson & Dopson, 1999; Connolly & McGing, 2006). People management skills are deemed indispensable for an industry that is almost entirely based on customer satisfaction and service delivery.

To add to this conception, Raybould and Wilkins (2006) compiled a list of generic skills which are needed for graduates who wish to enter the industry. These include oral communication skills, written communication skills, self-management skills, problem-solving skills, conceptual skills, analytical skills, information management skills, the ability to work as part of a team, leadership skills, interpersonal skills, adaptability and a willingness to learn. The attitudes of tourism and hospitality employees towards customer service and excellence are especially crucial. In this regard, Connolly and McGing (2006) noted that the industry requires well-grounded graduates who have developed a good balance between analytical and people skills. Chen and Cursoy (2007) concur by stating that students should not only have

operational skills, but also management skills in order to work successfully in the tourism and hospitality industry.

Raybould and Wilkins (2006) identified 10 skill descriptors related to the requirements from industry. This includes dealing effectively with customers, maintaining professional and ethical standards, operating calmly in crises situations, showing empathy, demonstrating listening skills, the ability to anticipate client needs, time management skills, cultural awareness, the ability to communicate effectively and the ability to work without close supervision. These skill descriptors served as conceptual guide for the industry-expectation questionnaire in the empirical part of the study. In their investigation on graduate education in Ireland, Connolly and McGing (2006) found that the hospitality industry is an important

stakeholder in hospitality education and that the industry requires hands-on skills and well-developed people skills. The study further suggests that the needs of industry should be prominent in designing curricula for hospitality management courses and that there should be an increased emphasis on industry placements where students can gain practical experience.

More skills training, case study-related assignments and the involvement of industry representatives should further enhance industry exposure and input. Raybould and Wilkins (2006) concede that hospitality curricula should meet both the needs of industry and those of students. The role of educators is especially crucial in ensuring that tourism and hospitality graduates have realistic expectation of the industry (Richardson, 2009; Richardson & Butler, 2011). Ricci (2010) notes that hospitality schools should highlight the various speciality options in hospitality training demanded from industry. Chuang *et al*. (2007) advocate for proper career guidance at university level and that career assistance programmes should be implemented to assist students in making appropriate career choices.

## RESEARCH METHODOLOGY

This investigation aimed to ascertain the expectations of Tourism and Hospitality Management students related to working in the industry, as well as what industry expects from graduates. Data collection comprised of two questionnaires: one administered to undergraduate Tourism Management and Hospitality Management students (enrolled for 2012), at the CUT and the other administered to industry stakeholders in the Bloemfontein area.

The student expectations questionnaire was based on the work of Lu and Adler (2009) and Richardson and Butler (2011). It measured the main reasons why students wanted to pursue a career in the industry. It also ascertained the sector in which students wanted to work and the positions they would prefer to commence with once they completed their studies. Students also had to indicate the positions they would like to attain in the course of their careers. Of the 323 students enrolled for undergraduate study at the CUT, 213 completed the questionnaire, representing a response rate of 66%. The industry expectation questionnaire was based on the work of Raybould and Wilkins (2006) and included 10 skill descriptors required by industry from graduates. It measured descriptors on a 4-point Lickert scale (1=don‟t know, 2=Not important, 3=Important and 4=Very important).

For the sake of this investigation, industry stakeholders included employers that are likely to employ graduates and comprised of graded accommodation establishments in the

Bloemfontein area, the food and beverage sector, convention and event management companies, travel agencies, tourist attractions and tourism and hospitality education. Only participants that had a formal and/or informal association with the CUT‟s Hotel School were targeted. Letters of invitation to participate in the study was sent to the entire population and was addressed to the owners/managers of the businesses. Of the 121 industry participants that were targeted, 40 respondents completed the questionnaire, yielding a response rate of 33%. A quantitative analysis of the findings was made possible, as two structured questionnaires were utilised as part of data gathering (Tewksbury, 2009). Data were analysed using SAS Version 9.2 where a combination of descriptive and inferential statistics (including a pro-max rotated factor analysis) were applied.

## RESULTS

**Data analysis: Student expectations**

The first question of the student expectation questionnaire intended to measure the main reason why students wanted to pursue a career in the tourism and hospitality industry. From a list of 12 options students had to select the 1 main reason why they wanted to pursue a career in Tourism and Hospitality Management. The responses are reflected in Table 1.

***TABLE 1*: STUDENTS: MAIN REASONS PURSUEING A CAREER IN TOURISM AND HOSPITALITY INDUSTRY**

| Main reasons | Frequency | Percentage |
|---|---|---|
| To start my own business in the tourism and hospitality industry. | 61 | 29.47% |
| To have opportunities to travel and/or work in exotic destinations. | 48 | 23.19% |
| To interact with clients and customers and to provide excellent service. | 25 | 12.08% |
| To continuously develop and refine my skills and expertise. | 16 | 7.73% |
| To attain a well-paying position. | 15 | 7.25% |
| To become a supervisor/manager. | 11 | 5.31% |
| To attain balance between career and family responsibilities. | 6 | 2.90% |
| To have a stable job in a specific geographical area. | 6 | 2.90% |
| To impart my knowledge to students and to train them to work in the tourism and/or hospitality industry. | 6 | 2.90% |
| To work in a vibrant and supporting environment. | 5 | 2.42% |
| To be able to work in a flexible working environment (flexible working hours). | 4 | 1.93% |
| To be exposed to challenges and finding solutions. | 4 | 1.90% |

It is clear from the responses in Table 1 that the majority of the students want to start their own business in the tourism and hospitality industry (29.47%), followed by the opportunity to travel to and/or work in exotic destinations (23.19%) and to interact with customers and to provide excellent service (12.08%). In a similar study conducted in the Australian context, Richardson (2009) found that the most important factor for students who wanted to pursue a career in the tourism and hospitality industry was to attain a well-paying position, followed by reasons such as promotion opportunities, job security and work environment. It is evident that the respondents of this investigation had different reasons for pursuing a career in the tourism and hospitality industry compared to the findings of Richardson (2009).

Students were also asked to indicate the sector in which they would prefer to work. The majority of respondents wanted to work in the convention and event management sector, followed by the travel sector and the food and beverage sector. The study of Chuang *et al*. (2007) conducted among hospitality management students in the American context found that most students prefer working in the food and beverage sector, followed by lodging and

accommodation and then in the convention and event sector. It thus corresponds to a certain extent with the findings of this study.

Students were asked to indicate the positions they intend to take first, as well as the positions they eventually want to attain. Positions were divided into 4 sections: 1) front-line positions (including reception, concierge, waiters, house keepers, tour guides, travel agents and events coordinators); 2) supervisory positions (including being the supervisor of a division, sales representatives, administration officers and human resources officers); 3) management positions (including the front office manager, food and beverage manager, marketing/sales manager, department manager and general manager); and 4) other positions. Table 2 indicates the positions respondents want to commence with and the positions they eventually want to attain.

It emanates from Table 2 and Table 3 that the majority of respondents intend to start with front-line positions, specifically as event coordinators. There are also a substantial number of students (37.56%) who want to start in a management position. It is interesting to note that a significant 32.99% of respondents indicated they intend to remain in front-line positions, while the majority of respondents want to eventually progress to managerial positions. The responses in the „other" category involve positions outside the tourism and hospitality industry.

***TABLE 2*: STUDENTS: POSITIONS TO COMMENCE WITH AND WORK TOWARDS**

| Starting level | Frequency | Percentage | Towards level | Frequency | Percentage |
|---|---|---|---|---|---|
| 1. Front line | 106 | 51.71% | 1. Front line | 65 | 32.99% |
| 2. Supervisory | 18 | 8.78% | 2. Supervisory | 10 | 5.08% |
| 3. Management | 77 | 37.56% | 3. Management | 114 | 57.87% |
| 4. Other | 4 | 1.95% | 4. Other | 8 | 4.06% |

***TABLE 3*: STUDENTS: CROSS-TABLE ON STARTING VS WORKING TOWARDS POSITION**

| | | Towards level | | | | | |
|---|---|---|---|---|---|---|---|
| **Starting level** | | | 1. | 2. | 3. | 4. | **Total** |
| Missing values | f | 0 | 1 | 0 | 1 | 0 | 2 |
| | % | 0.0 | 50.0 | 0.0 | 50.0 | 0.0 | |
| 1. Front line | f | 4 | 47 | 3 | 50 | 2 | 106 |
| | % | 3.77 | 44.34 | 2.83 | 47.17 | 1.89 | |
| 2. Supervisory | f | 0 | 4 | 5 | 9 | 0 | 18 |
| | % | 0.0 | 22.22 | 27.78 | 50.0 | 0.0 | |
| 3. Management | f | 6 | 12 | 2 | 54 | 3 | 77 |
| | % | 7.79 | 15.58 | 2.60 | 70.13 | 3.90 | |
| 4. Other | f | 0 | 1 | 0 | 0 | 3 | 4 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| | % | 0.0 | 25.00 | 0.0 | 0.0 | 75.00 | |
| **Total** | **F** | **10** | **65** | **10** | **114** | **8** | **207** |

Although small, it may give an indication of students currently in Tourism and Hospitality Management learning programmes who would like to see themselves in a career outside the industry. It is encouraging to note that by far the majority of respondents want to pursue a career in the industry. A chi-square test confirmed a significant difference between starting positions and the positions students are working towards (97.8142; $p<0.0001$).

**Data analysis: Industry expectations**

The industry expectation questionnaire aimed to ascertain the main graduate skills which employers require. Most of the respondents were in the graded accommodation sector (32.5%), followed by the food and beverage sector (20%), convention and event management sector (17.5%), travel sector (15%), tourism attractions (10%) and tourism and hospitality education (5%). A variety of graduate skills were put to the respondents. They had to indicate the importance of each skill on a 4-point Lickert scale. The responses of the industry stakeholders are detailed in Table 4.

When the mean scores (Table 4) were analysed it became apparent that respondents view dealing effectively with customers as the most important quality that students should have, followed by maintaining professional standards, a positive attitude, adaptability and flexibility and being service-oriented. By reflecting on the inter-quartile range it is also apparent that all the graduate skills, some more than others, are important to industry stakeholders. To establish any underlying graduate skills employers deem crucial, a pro-max rotated factor analysis was performed on the 17 items. A screen plot of eigen values indicated that 2 main factors can be considered for the factor analysis. Table 5 presents the factor loadings per item.

***TABLE 4*: INDUSTRY STAKEHOLDERS: GRADUATE SKILLS REQUIRED**

| Variable | Mean | SD | Median | Inter-quartile range |
|---|---|---|---|---|
| Deal effectively with customers | 3.93 | 0.27 | 4.00 | 4.00; 4.00 |
| Maintain professional standards | 3.83 | 0.45 | 4.00 | 4.00; 4.00 |
| Positive attitude | 3.83 | 0.38 | 4.00 | 4.00; 4.00 |
| Adaptability and flexibility | 3.75 | 0.44 | 4.00 | 3.50; 4.00 |
| Behave calmly in crises situations | 3.73 | 0.45 | 4.00 | 3.00; 4.00 |
| Service-oriented | 3.73 | 0.45 | 4.00 | 3.00; 4.00 |
| Listening skills | 3.68 | 0.47 | 4.00 | 3.00; 4.00 |
| Communication skills | 3.65 | 0.48 | 4.00 | 3.00; 4.00 |
| Teamwork skills | 3.65 | 0.48 | 4.00 | 3.00; 4.00 |
| Empathy in dealing with customers | 3.60 | 0.50 | 4.00 | 3.00; 4.00 |

| | | | | |
|---|---|---|---|---|
| Cultural awareness | 3.60 | 0.74 | 4.00 | 3.00; 4.00 |
| Technical skills | 3.58 | 0.50 | 4.00 | 3.00; 4.00 |
| Management skills | 3.53 | 0.55 | 4.00 | 3.00; 4.00 |
| Information and communication skills | 3.40 | 0.59 | 3.00 | 3.00; 4.00 |
| Leadership skills | 3.40 | 0.71 | 3.50 | 3.00; 4.00 |
| Work without supervision | 3.33 | 0.66 | 3.00 | 3.00; 3.00 |
| Possess relevant qualifications | 3.30 | 0.65 | 3.00 | 3.00; 4.00 |

SD= Standard Deviation

The Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy is a popular diagnostic measure. It is suggested that KMO measures of below 0.50 is unacceptable and the overall KMO measure should be greater than 0.80; however, a measure of above 0.60 is tolerable. The overall KMO measure can sometimes be increased by deleting the offending variables whose KMO value is low.

By using a primary factor loading of 0.4 or above, as minimum criteria, the contributing items to the specific factor are highlighted in Table 5. Ignoring the 3 cross-factors („Cultural awareness", „Working without supervision" and „Empathy in dealing with customers"), 6 and 5 primary factors are identified for factor 1 (management/technical skills), and factor 2 (people skills), respectively.

***TABLE 5*: ROTATED FACTOR LOADINGS PER ITEM**

| **Items** | **Factor1: Management/ Technical skills** | **Factor2: People skills** |
|---|---|---|
| Culture awareness | 0.69 | 0.40 |
| Management skills | 0.67 | 0.04 |
| Possess relevant qualifications | 0.64 | -0.04 |
| Technical skills | 0.63 | 0.05 |
| Communication) | 0.56 | 0.04 |
| Service-oriented | 0.51 | -0.11 |
| Work without supervision | 0.49 | 0.42 |
| Adaptable and flexible | 0.47 | 0.17 |
| Communication and technology skills | 0.17 | 0.13 |
| Listening skills | -0.05 | 0.76 |
| Maintain professional standards | -0.10 | 0.67 |
| Behave calmly in crisis situations | -0.04 | 0.63 |
| Leadership skills | 0.47 | 0.62 |
| Teamwork skills | 0.06 | 0.62 |

| | | |
|---|---|---|
| Empathy in dealing with customers | 0.41 | 0.41 |
| Deal effectively with customers | 0.10 | 0.32 |
| Positive attitude | 0.22 | 0.30 |

Kaiser's Measure of Sampling Adequacy: Overall MSA= 0.598

**DISCUSSION**

Due to the demanding nature of the tourism and hospitality industry and the serious skills shortages the industry face, it is imperative that both students and the industry reflect on what they expect from each other. Data gathering for this study involved administering two questionnaires, namely one to undergraduate Tourism and Hospitality Management students at CUT and the other to industry stakeholders in the Bloemfontein area. As indicated before, the Tourism and Hospitality Management undergraduate programmes of the CUT incorporate a strong vocational and hands-on approach in an attempt to produce graduates who are able to cope with the demanding work environment associated with the industry. This corresponds with the opinion of Connolly and McGing (2006), who advocate a vocational approach to training tourism and hospitality graduates.

The analysis of the findings from the student expectation questionnaire shows that most students studying Tourism and Hospitality Management at the CUT would like to start their own businesses, followed by travelling to exotic destinations. This is in contrast to a similar study conducted by Richardson and Butler (2011) in the Australian context, which found the main reason as to why students pursue a career in the tourism and hospitality industry was to attain a well-paying position with promotion opportunities. It is fairly easy to start a small business in the industry in the South African context, which may account for students‟ desire to be entrepreneurial. From a sectorial perspective it is clear that the majority of respondents want to work in the convention and event management sector. In order to address this need, the CUT is currently undertaking the development of a unique diploma in Event Management in consultation with major industry partners.

The demanding nature of the industry is globally recognised being that of a hectic work environment characterised by long and irregular hours. A notable exception is the teaching field. A study by Chen and Gursoy (2007) found that graduates who worked in a teaching environment were generally more satisfied with their jobs in what they term the „leisure, recreation and tourism industry‟. The respondents were also less concerned with high-paying salaries and enjoyed imparting their knowledge in an educational context.

The responses of the student expectation questionnaire revealed that 37.56% of students were intent on starting their career in a managerial position. This indicates that students may not have accurate expectations, again emphasising the importance of educators in providing accurate information to graduates (Richardson, 2009; Richardson & Butler, 2011). Richardson (2009) found that, as students gain more experience in progressing with their studies, the more negative they become regarding their career opportunities in the industry. Chuang *et al*. (2007) concur by stating that first- and second-year students have a narrower range of career expectations compared to senior students, as senior students had more exposure to the industry. On a practical level, tourism and hospitality schools should facilitate frequent interaction between students and the respective industries through, for example,

guest lectures from industry specialists, arranging industry days for students, and tutorials. This could bridge the gap between perception and reality in the sense that industry leaders can inform students of the realities and their expectations of new graduates.

It is clear from the responses to the industry expectation questionnaire that the ability to deal effectively with customers is the most prominent skill required by industry. This is followed by maintaining professional standards, a positive attitude, adaptability and flexibility and being service-oriented. Though factor analysis is was possible to identify two prominent factors related to the skills industry require from graduates: management/technical skills and people skills. The findings correspond with similar studies conducted on the topic (Raybould & Wilkins, 2006; Lu & Adler, 2009; Richardson & Butler, 2011). The study thus gives credence to the importance of both management/technical skills in an industry that is extremely labour-intensive and people-oriented on the one hand and extensively operational on the other.

## CONCLUSION

Tourism and hospitality schools at institutions of higher learning must take cognisance of the graduate skills required by their respective industries. It is of little use training students without taking industry needs into consideration. Students should be closely monitored while

doing WIL and lecturers should also be exposed to industry on a regular and formal basis in order to stay abreast of new trends and needs. By looking at the most important graduate skills needed by industry, as identified in this study, it is clear that Tourism and Hospitality Management training should go beyond mere vocational training to include very specific modules on topics, such as: entrepreneurship, leadership and management; there should be a continuous emphasis on service excellence and customer satisfaction. Although this paper only focused on one university, the findings are never the less important in comprehending the requirements from industry and the expectations from students. It is recommended that future research should include more universities, and not just UoTs, that offer tourism and hospitality programmes.

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# RELATIONSHIP BETWEEN LEISURE INVOLVEMENT AND SUBJECTIVE WELL-BEING: MODERATING EFFECT OF SPOUSAL SUPPORT

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***ABSTRACT***

*The purpose of this study was to examine the relationship between leisure involvement and subjective well-being and clarify the moderating effect of spousal support in this relationship. A total of 254 questionnaires were collected from a sample of players of slow pitch softball. Structural equation modelling was utilised to estimate a model that linked leisure involvement and spousal support to subjective well-being. As expected, the results show that a recreation having greater leisure involvement leads to a high level of subjective well-being. The findings further show that spousal support moderate the effect of leisure involvement on subjective well-being, indicating that greater spousal support is associated with a higher likelihood that leisure involvement will improve subjective well-being.*

**Key words:** Leisure involvement; Spousal support; Subjective well-being; Slow pitch softball.

## INTRODUCTION

Taiwan is a small country, but its baseball teams are famous around the world, and baseball has become a symbol of Taiwan's unique culture and unique destiny (Morris, 2004). Since baseball and slow pitch softball are similar games, differing mainly in the size of the field, rules and equipment, slow pitch softball is very popular, and has become one of the most

actively pursued leisure activities in Taiwan. Research about participation in this activity is sparse, but it falls into two broad categories. One involves the technical issues around slow pitch softball (Smith *et al.*, 2003; Wu *et al.*, 2011), and the other concerns the recreational experience and behaviour of slow pitch softball players (Cross & Nathan, 2009; Liardia & Carron, 2011). Additionally, whereas several investigations have discussed the leisure involvement in various activities (Kyle *et al.*, 2003; Kyle *et al.*, 2006), a minority have focused on slow pitch softball. Players commonly invest a great deal of money, time and effort into slow pitch softball. Whether all slow pitch softball participants with a high degree of involvement exhibit a high degree of subjective well-being warrants further study.

Leisure is defined as free time in which a self-determined activity or experience is enjoyed. Leisure provides feelings of pleasure, supports a set of beliefs that favour a particular lifestyle and is an expression of ideal living. Leisure may be utilised to achieve a healthy body, a high quality of life and a feeling of subjective well-being (Godbey, 2003). In recent decades, scholars in the fields of psychology, gerontology and leisure studies have been very interested

in subjective well-being (SWB). SWB refers to an individual‟s assessment of his or her own quality of life (Pavot & Diener, 2004). According to Diener *et al.* (1999), positive affect, negative affect and life satisfaction are the main dimensions of SWB. Individual participation in activities can improve life satisfaction and subjective well-being (Havighurst & Albrecht, 1953; Lemon *et al.*, 1972). Numerous empirical studies have identified a positive correlation between participation in such activities and subjective well-being (Okun *et al.*, 1990; Leventhal *et al.*, 2001).

The literature on well-being reveals a clear link between social support and subjective well-being (Cohen & Wills, 1985; Kessler & McLeod, 1985; Heady & Wearing, 1990; Sarason *et al.*, 1990; Siebert *et al.*, 1999). Several investigations have demonstrated that spousal support, as a form of social support, plays a role in reducing marital pressures (Roskies & Lazarus, 1980), work and non-work conflicts (Holohan & Gilbert, 1979), as well as family conflicts (Kundsin, 1974; Beutell & Greenhaus, 1982; Berkowitz & Perkins, 1984). Family-based social support also increases well-being (Thompson & Heller, 1990).

Most people participate in fleeting, mass and low-yield leisure activities. Such leisure activities fail to provide participants with a meaningful experience and, consequently, participants feel bored. People should be encouraged to participate in leisure activities that result in long-term advantages and to make these activities part of their everyday lives (Stebbins, 1980). Stebbins (1992) recognise that meaningless leisure causes social problems and he advocates „serious leisure‟. Stebbins believes that serious leisure allows participants to engage in fulfilling, meaningful and interesting activities outside the workplace. Restated, when participating in leisure activities, individuals could adopt a serious attitude and immerse themselves deeply in the activity; exhibit a high level of commitment and persistence, and allow the activity to become central to their lives. Hence, serious leisure induces a sense of gratification and a feeling of „being someone‟. Participants in such leisure activities do not simply „participate‟: they also make leisure a part of their daily lives and are willing to engage in regular and sustained leisure activities over a long period. The spirit of perseverance allows participants to acquire skills, knowledge and experience by participating in these activities (Stebbins, 1992).

Qualities such as perseverance, having careers in their endeavours, significant individual

effort, durable individual benefits, a unique ethos and strong identification with the activity are implicitly tangible and intangible investment in serious leisure activities (Stebbins, 2007), and are related to the degree of leisure involvement (Kyle & Chick, 2002). The time and effort that are invested in particular leisure activities are related to a set of external behaviours that are consistent with Stone‟s concept of leisure involvement (Stone, 1984). Moreover, close links between the participant and the activity leads to a consistent pattern of involvement (Zaichkowsky, 1985; Celsi & Olson, 1988). According to research, a continued investment in enjoyable leisure activities generates feelings of excitement, involvement and focus on that activity. Additionally, such activities provide a channel for self-expression and may lead to close links with other individuals in a network in which participants have a particular activity in common (Havitz & Dimanche, 1997; Wiley *et al.*, 2000). Brown *et al.* (1991) identified a positive correlation between participation in various types of leisure activity and well-being. For Argyle (1987), leisure, defined as life outside work, is an important predictor of well-being. The cited investigations have revealed a causal relationship between leisure involvement and well-being.

Some individuals with a committed leisure involvement invest a great deal of money, time, and effort in their chosen activity. However, since leisure cannot be artificially separated from family life (Kelly & Kelly, 1994), the continued pursuit of leisure goals may reduce the amount of time spent with a spouse or family, as well as the capacity and willingness to meet family responsibilities. Therefore, individuals with high levels of leisure involvement are commonly forced to choose between leisure and family or spouse, detrimentally affecting life satisfaction and emotional stability. Studies have shown that when spouses enjoy the same leisure activities, they tend to be satisfied with married life (Orthner & Mancini, 1990). Failing to do so can cause conflict (Holman & Epperson, 1984; Goff *et al.*, 1997), and marital problems (Stebbins, 1992). Individuals who have the support from a spouse can effectively reduce conflict between leisure involvement and married life (Burke & Weir, 1982), and motivate the participant to continue involvement in his or her favoured activity (Stebbins, 1992).

According to the foregoing discussion, greater involvement in leisure activities should lead to enhanced well-being. However, the following question is raised: When participants have a high degree of leisure involvement that is not supported by their spouses, do they enjoy improved well-being? Restated, does spousal support play a moderating role in the relationship between leisure involvement and well-being? This study focuses on this question. Therefore, the relationship between leisure involvement, spousal support and well-being is examined.

## THEORETICAL FRAMEWORK

### Relationship between leisure involvement and subjective well-being

Leisure involvement is an indication of the importance of a particular leisure activity for the participant, interested in such activities and the symbolic value attained from it (Havitz & Dimanche, 1997; 1999). Measures of leisure activity participation reflect the frequency of participation and can be used to obtain a more accurate understanding of the nature of participation, the importance attached to leisure activities and the way in which an individual develops an interest in the activity (Wiley *et al.*, 2000).

In the field of leisure and recreation, numerous studies of the relationship between participation in recreational activities and well-being have demonstrated that sustained involvement supports well-being. Regular and sustained participation in physical activity generates and enhances feelings of well-being (Ruuskanen & Ruoppila 1995; Hassmen *et al.*, 2000; Resnick, 2000). Reich and Zautra (1981) found that enduring participation in a particular leisure activity reduces everyday stress and increases psychological well-being. Berger and McInman (1993) also claimed that regular exercise over a long period induces feelings of well-being that reduce anxiety and frustration. Moreover, higher levels of involvement are associated with greater improvements in overall well-being. Rejeski *et al.* (2001) worked with long-term sedentary subjects and found that an increase in their physical activity is positively related to well-being and satisfaction with physical function. A study of college students by Lu and Hu (2005), identified positive correlations between leisure involvement and both leisure satisfaction and well-being. Finally, the work of Staempfli (2007) with young people also revealed that leisure participation and leisure satisfaction positively affected well-being.

**Moderating effect of spousal support**

Literature reviewed on well-being indicates a relationship between social support and subjective well-being. For example, social support is significantly associated with well-being and the absence of psychological distress (Kessler & McLeod, 1985); social support enhances psychological well-being (Cohen & Wills, 1985; Heady & Wearing, 1990; Sarason *et al*., 1990); a positive correlation exists between social support and life satisfaction, and social support is a better predictor of well-being than financial income (Siebert *et al.*, 1999).

Social support is divided into work-related and non-work-related categories. Spousal support is a form of non-work-related social support and plays an important role in reducing work and non-work conflict (Holohan & Gilbert, 1979). Furthermore, social support from the family is effective in enhancing well-being (Thompson & Heller, 1990). Munroe and Steiner (1986) found that social support is associated with a reduced occurrence of depressive symptoms. Parasuraman *et al.* (1992) demonstrated that social support buffers (moderates) the relationship between various sources of stress and overall well-being. Finally, Suchet and Barling (1986) revealed that spousal support moderates the negative effects of conflict. All of the above indicate that spousal support clearly plays a moderating role in mental health and well-being.

In the literature on leisure and recreation, people with a high level of leisure involvement are assumed to make certain trade-offs that depend partially on the support of their participation from their family or spouse. When individuals with a high level of leisure involvement invest considerable time and effort in an activity, they necessarily reduce the amount of time they spend with their spouse or family. Hence, in a sense, leisure cannot be artificially separated from family life (Kelly & Kelly, 1994). Orthner and Mancini (1990) demonstrated that when husband and wife shared their leisure time, they tend to exhibit greater satisfaction with their leisure activities, whereas not sharing leisure time has a negative effect on marital satisfaction. Holman and Epperson (1984) and Orthner and Mancini (1990), point out that when husband and wife do not accept the other‟s leisure interests, conflict between leisure and family life arises. Additionally, a high degree of leisure involvement causes misunderstanding and alienation from friends and spouse (and family members) who may not understand the

reasons for engaging in the activity (Stebbins, 1992). After studying numerous participants in serious leisure, Stebbins (1992) asserts that such participation could, in some cases, cause marriage break down. In addition, Goff *et al.* (1997) found that spousal support for running-related activities reduced family conflict. Conversely, family conflict increases when the spouse does not support the activities of a runner. Barrell *et al.* (1989) interviewed runners and their spouses and found that in some cases, running was the source of strained relationships between family members. On the other hand, research on intra-family interaction has shown that support for a spouse reduces conflict in the family (Burke & Weir, 1982). Stebbins (1992) also noted that such support is expressed in various forms of encouragement, which motivate participants to continue the activity.

In summary, spousal support is commonly found to buffer stress by strengthening physical and mental health, while spousal support also plays a moderating role in marital relationships, everyday life and conflicts. Instead of focusing on the effect of the pursuit of serious leisure on the family, Goff *et al.* (1997) examined the well-being of individuals with high levels of leisure involvement that was moderated by spousal support. Therefore, for participants with a high level of leisure involvement, spousal support can be reasonably predicted to moderate their subjective assessment of well-being.

## RESEARCH HYPOTHESES

Based on the above-mentioned literature review, this study proposes that individuals with higher sustained involvement in a particular activity exhibit greater perseverance and develop a social support network with other enthusiasts. These individuals are expected to enjoy greater life satisfaction and positive emotions. Accordingly, leisure involvement is reasonably predicted to have a direct and positive effect on well-being. The following hypotheses are proposed:

> For slow pitch softball participants, a higher level of leisure involvement results in greater subjective well-being (H1).
>
> The spousal support received by slow pitch softball participants moderates the relationship between leisure involvement and subjective well-being. Accordingly, when slow pitch softball participants enjoy a high degree of spousal support, the positive relationship between leisure involvement and well-being is stronger than for slow pitch softball participants who get only a low level of spousal support. (H2)

## METHOD

### Sample

This study involved married slow pitch softball team members in Southern Taiwan and participants in slow pitch softball activities that are organised by government agencies and organisations. The research subjects are all long-term amateur participants and invest substantial money, time and effort in slow pitch softball-related activities. Of the 254 respondents who returned questionnaires, 85.8% were young adults who were between 21 and 40 years old; 40.9% were educated at university level, and 77.9% participated in slow pitch softball between 2 and 3 times a month. Their most common field of work was manufacturing (26.8%), followed by occupations in the service sector (23.6%).

## Measurement instrument

### *Leisure involvement*

In this study, leisure involvement is defined in terms of the degree of excitement generated by, engagement in and focus on slow pitch softball activities. Therefore, the level of leisure involvement in slow pitch softball is measured in the 3 dimensions proposed by McIntyre and Pigram (1992). A total of 12 items, comprising 5 items related to attraction, 4 related to self-expression, and 3 related to centrality-to-lifestyle, were considered. All items were measured using a 7-point Likert scale, ranging from „strongly disagree" (1) to „strongly agree" (7).

### *Subjective well-being*

In this study, the scale for subjective well-being consists of 3 components: life satisfaction; positive affect; and negative affect. The life satisfaction scale is adapted from the *Satisfaction with Life Scale* (SWLS) of Diener *et al.* (1985), and involves 5 items. To measure positive affect and negative affect, the 8 affect terms identified by Diener and Emmons (1985) were used. These comprised 4 positive affect terms and 4 negative affect terms. Respondents were asked to respond based on their emotions over the preceding 3 months. All items were scored using a 7-point Likert scale, ranging from „strongly disagree" (1) to „strongly agree" (7).

### *Spousal support*

Spousal support measures the effectiveness of the support that a participant receives from his or her spouse. The spousal support scale used in this study was adapted from scales proposed by Burke and Weir (1982), Fernandez (1986), Goff *et al.* (1990) and Goff *et al.* (1997). The scale involves the following 4 items: "I feel that my spouse approves of my leisure activity"; "My spouse has a positive view of the investment I make in my leisure activity"; "My spouse shows an interest in and discusses my leisure activity"; and "My spouse is an important source of moral support for my continued participation in my leisure activity". All items were measured using a 7-point Likert scale, ranging from „strongly disagree" (1) to „strongly agree" (7).

## RESULTS

### Reliability and validity testing

Structural equation modelling (SEM) was adopted to validate the scales and structural relationships among exogenous and latent concepts. A 2-stage analysis was conducted (Hair *et al.,* 1998). Confirmatory factor analyses (CFA) were firstly analysed for their measurement model. The fit of the measurement model was estimated using the maximum likelihood estimation procedure in the AMOS 6.0 statistical package. The CFA were performed separately for exogenous and latent factors. Composite reliability (CR) and average variance extracted (AVE) were calculated to evaluate reliability.

Before the path analysis was conducted, the reliability and validity of the scales that included more than a single indicator were evaluated. First, the internal consistency of the indicators (items) that measured the constructs was examined by using composite reliability tests. Analytical results (Table 1) show that the composite reliabilities for the 3 dimensions of

leisure involvement (0.85, 0.88, and 0.76), Life satisfaction (Ls) (0.87), Positive affect (Pa) (0.83), Negative affect (Na) (0.82), and spousal support (0.81), all exceed the recommended value of 0.7. Therefore, the reliability of the scale was deemed acceptable (Bagozzi & Yi, 1988).

***TABLE 1*: RESULTS OF CFA**

| Dim | Variable | M | SD | SK | KU | SFL | SMC | EV | CR | AVE |
|---|---|---|---|---|---|---|---|---|---|---|
| Leisure Involvement | *Attraction* | 4.72 | | | | | | | 0.85 | 0.53 |
| | Att1 | 4.74 | 1.30 | -0.14 | -0.51 | 0.70*[b] | 0.49 | 0.86* | | |
| | Att2 | 4.75 | 1.34 | -0.16 | -0.62 | 0.72* | 0.51 | 0.88* | | |
| | Att3 | 4.68 | 1.41 | -0.19 | -0.66 | 0.79* | 0.63 | 0.74* | | |
| | Att4 | 4.75 | 1.36 | -0.24 | -0.73 | 0.71* | 0.50 | 0.92* | | |
| | Att5 | 4.66 | 1.39 | -0.23 | -0.50 | 0.72* | 0.52 | 0.93* | | |
| | *Self-expression* | 4.64 | | | | | | | 0.88 | 0.65 |
| | Se1 | 4.71 | 1.15 | -0.11 | -0.09 | 0.93* | 0.87 | 0.17* | | |
| | Se2 | 4.52 | 1.07 | 0.05 | -0.05 | 0.73* | 0.53 | 0.53* | | |
| | Se3 | 4.43 | 1.08 | -0.31 | 0.09 | 0.71* | 0.51 | 0.58* | | |
| | Se4 | 4.88 | 1.32 | -0.30 | -0.39 | 0.82* | 0.68 | 0.56* | | |
| | *Central-to-lifestyle* | 4.76 | | | | | | | 0.76 | 0.51 |
| | Ce1 | 4.80 | 1.23 | -0.09 | -0.50 | 0.68* | 0.46 | 0.81* | | |
| | Ce2 | 4.77 | 1.42 | -0.39 | -0.27 | 0.71* | 0.51 | 1.00* | | |
| | Ce3 | 4.70 | 1.32 | -0.30 | -0.50 | 0.76* | 0.58 | 0.73* | | |
| Subjective well-being | *Life satisfaction* | 5.15 | | | | | | | 0.87 | 0.58 |
| | Ls1 | 5.11 | 1.31 | -0.46 | -0.35 | 0.81* | 0.65 | 0.59* | | |
| | Ls2 | 5.19 | 1.24 | -0.27 | -0.64 | 0.77* | 0.59 | 0.64* | | |
| | Ls3 | 5.20 | 1.16 | -0.52 | -0.15 | 0.76* | 0.57 | 0.57* | | |
| | Ls4 | 5.12 | 1.24 | -0.30 | -0.40 | 0.77* | 0.60 | 0.61* | | |
| | Ls5 | 5.11 | 1.36 | -0.54 | -0.10 | 0.68* | 0.46 | 0.99* | | |
| | *Positive affect* | 5.19 | | | | | | | 0.83 | 0.54 |
| | Pa1 | 5.16 | 1.23 | -0.47 | -0.18 | 0.78* | 0.61 | 0.59* | | |
| | Pa2 | 5.20 | 1.37 | -0.52 | -0.50 | 0.70* | 0.49 | 0.95* | | |
| | Pa3 | 5.14 | 1.21 | -0.34 | -0.28 | 0.76* | 0.58 | 0.62* | | |
| | Pa4 | 5.27 | 1.25 | -0.41 | -0.55 | 0.70* | 0.49 | 0.79* | | |
| | *Negative affect* | 5.20 | | | | | | | 0.82 | 0.54 |
| | Na1 | 5.19 | 1.25 | -0.42 | -0.46 | 0.77* | 0.59 | 0.65* | | |
| | Na2 | 5.10 | 1.31 | -0.42 | -0.03 | 0.73* | 0.53 | 0.81* | | |
| | Na3 | 5.25 | 1.24 | -0.47 | -0.18 | 0.67* | 0.45 | 0.85* | | |
| | Na4 | 5.20 | 1.34 | -0.60 | 0.04 | 0.76* | 0.58 | 0.75* | | |
| Spousal support | *Spousal support* | 3.57 | | | | | | | 0.81 | 0.53 |
| | Sp1 | 3.57 | 1.49 | 0.97 | 0.16 | 0.67* | 0.45 | 0.82* | | |
| | Sp2 | 3.80 | 1.52 | 0.71 | -0.56 | 0.82* | 0.67 | 0.76* | | |
| | Sp3 | 3.51 | 1.42 | 0.80 | -0.01 | 0.76* | 0.58 | 0.92* | | |
| | Sp4 | 3.40 | 1.28 | 1.23 | 1.34 | 0.63* | 0.40 | 1.04* | | |

Dim= Dimension; M= Mean; SD= Standard Deviation; SK= Skew; KU= Kurtosis;
SFL= Standardised factor loadings; SMC= Squared multiple correlation; EV= Error variance;
CR= Composite reliability; AVE= Average variance extracted * Significance level set at $\alpha$=0.05

Convergent validity was assessed by determining whether all factor loadings were significant (Bagozzi & Yi, 1988). Analytical results (Table 1) indicate that all factor loadings significantly differed from zero, as evidenced by their consistently high t-values. Additionally, the AVE values (0.51-0.65), which obviously exceeded 0.5 for each dimension, also supported convergent validity (Fornell & Larcker, 1981). Hence, the measurement model results provided evidence of convergent validity for the constructs.

The discriminant validity of the scale was examined, as suggested by Fornell and Larcker (1981). The square root of the AVE of each constructs should exceed the correlation coefficient between any pair of constructs. Analytical results (Table 2) show that the square root of the AVE of each construct was in the range 0.72-0.80. Accordingly, the AVEs of all of the constructs exceeded the correlation coefficient between any pair of constructs (0.01-0.45). These analytical results supported the discriminant validity of all constructs.

Convergent validity was assessed by determining whether all factor loadings were significant (Bagozzi & Yi, 1988). Analytical results (Table 1) indicate that all factor loadings significantly differed from zero, as evidenced by their consistently high t-values. Additionally, the AVE values (0.51-0.65), which obviously exceeded 0.5 for each dimension, also supported convergent validity (Fornell & Larcker, 1981). Hence, the measurement model results provided evidence of convergent validity for the constructs.

***TABLE 2*: CORRELATION COEFFICIENTS BETWEEN CONSTRUCTS**

| Construct | Correlation coefficient | | | | | | |
|---|---|---|---|---|---|---|---|
| | **A** | **B** | **C** | **D** | **E** | **F** | **G** |
| A. Attraction | **0.73**[a] | | | | | | |
| B. Self-expression | 0.38* | **0.80** | | | | | |
| C. Central-to-lifestyle | 0.44* | 0.37* | **0.72** | | | | |
| D. Life satisfaction | 0.17* | 0.18* | 0.11 | **0.76** | | | |
| E. Positive affect | 0.19* | 0.18* | 0.25* | 0.40* | **0.74** | | |
| F. Negative affect | 0.22* | 0.24* | 0.14* | 0.45* | 0.38* | **0.73** | |
| G. Spousal support | -0.31* | -0.15* | -0.13* | 0.01 | 0.02 | 0.04 | **0.72** |

Diagonal elements (bold)= Square root of average variance extracted (AVE) between the constructs and their measures. Off-diagonal elements are correlations between constructs. Significance= *p<0.001

In summary, the scale was developed satisfactorily, as revealed by reliability in the sense of internal consistency and the convergent and discriminant validities of the constructs.

**Analysis of data**

The hypotheses proposed in this study were tested by applying structural equation model using AMOS 6.0. Maximum likelihood estimation was conducted with the covariance matrix

as the input matrix. Analytical results (Figure 1) indicate a Chi-square value of 10.423 (degree of freedom = 8) with a non-significant p-value of 0.237. Root Mean Square Residual (RMR) and Root Mean Square Error of Approximation (RMSEA) were 0.036, 0.035. Goodness of Fit Index (GFI) and Adjusted Goodness of Fit Index (AGFI) were 0.986 and 0.964. Comparative Fit Index (CFI) and Non Normal Fit Index (NNFI) were 0.990 and 0.982. Statistical results verify that the hypothesised model fitted the data sufficiently well to enable path analysis to be carried out for testing the hypotheses.

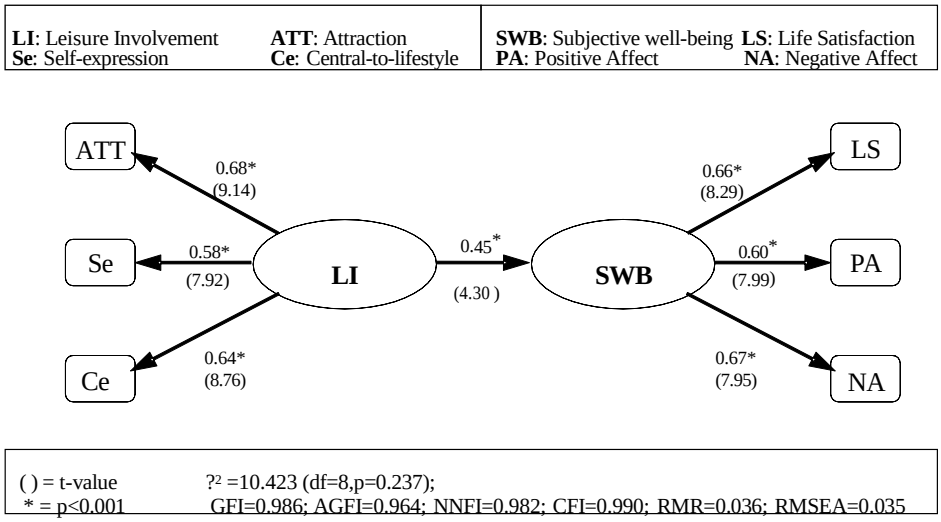


***FIGURE 1*: PATH DIAGRAM OF RESEARCH MODEL**

Path analysis results support Hypothesis 1, indicating that leisure involvement had a significant impact on subjective well-being (standardised coefficient = 0.448, t = 4.301). The ways in which leisure involvement affects life satisfaction, positive affect and negative affect (reversed score) were also evaluated. The results further reveal that leisure involvement significantly affects life satisfaction (standardised coefficient = 0.259, t = 3.002), positive affect (standardised coefficient = 0.361, t = 3.888), and negative affect (standardised coefficient = 0.330, t = 3.656).

**Test for moderating effect of spousal support**

***Grouping***

The moderating effect of spousal support was examined by dividing respondents into groups of high and low spousal support, based on their responses on the spousal support scale. A K-means cluster analysis was performed for grouping because it allows researchers to specify

the number of clusters (Hair *et al*., 1998). Specifically, the high spousal support group comprised 84 respondents and the low spousal support group comprised 170 respondents. An independent sample t-test was conducted to confirm the effectiveness of the grouping, and to test whether the mean spousal support differed significantly between the two groups. The t-test reached significance, given p-value of 0.00 and t-value of 25.818. Analytical results

revealed favourable K-means grouping. Hence, the groups that scored high and low for spousal support differed significantly.

***Test for structural invariance***

Tests of the invariance of the regression weight for specific paths were conducted. The regression weights of paths (LI→SWB/LS/PA/NA) in the tested models were constrained to equality across groups. Furthermore, all paths in the baseline models could be freely estimated. Next, tests for Chi-square differences between the baseline models and the constrained models were performed to ensure path-coefficient equality (Yoo, 2002). Table 3 summarises the results of the invariance tests for the specific paths. As expected, significant Chi-square differences were identified across groups, revealing that spousal support significantly moderated the paths: LI→SWB/LS/PA/NA.

***TABLE 3*: TEST FOR STRUCTURAL INVARIANCE**

| IV | DV | Models | $\chi 2$ | df | $\Delta\chi 2$ |
|---|---|---|---|---|---|
| LI | SWB | Baseline | 16.615 | 26 | |
| | | Constrained( $\gamma_{li-swb}^{high} = \gamma_{li-swb}^{low}$ ) | 23.903 | 27 | 7.288* |
| | LS | Baseline | 57.146 | 26 | |
| | | Constrained ( $\gamma_{li-ls}^{high} = \gamma_{li-ls}^{low}$ ) | 67.784 | 27 | 10.638* |
| | PA | Baseline | 30.085 | 26 | |
| | | Constrained ( $\gamma_{li-pa}^{high} = \gamma_{li-pa}^{low}$ ) | 38.504 | 27 | 8.419* |
| | NA | Baseline | 45.417 | 26 | |
| | | Constrained ( $\gamma_{li-pa}^{high} = \gamma_{li-pa}^{low}$ ) | 51.450 | 27 | 6.033* |

IV= Independent Variable; DV= Dependent Variable; LI= Leisure Involvement; * $p < 0.05$
SWB= Subjective Well-being; LS= Life Satisfaction; PA= Positive Affect; NA= Negative Affect
DF= Degrees of Freedom

Table 4 demonstrates that the path coefficients of the high-spousal support group exceeded those of the low-spousal support group. Hence, spousal support is inferred to moderate the relationships between leisure involvement and subjective well-being, life satisfaction, positive affect or negative affect.

***TABLE 4*: PATH COEFFICIENT FOR LOW AND HIGH GROUP**

| Paths | Standardised Estimates | |
|---|---|---|
| | Low Spousal support group | High Spousal support group |
| LI→SWB ( $\gamma_{li-swb}$ ) | 0.509* | 0.762* |
| LI→LS ( $\gamma_{li-ls}$ ) | 0.298* | 0.565* |
| LI→PA ( $\gamma_{li-pa}$ ) | 0.385* | 0.618* |
| LI→NA ( $\gamma_{li-na}$ ) | 0.356* | 0.606* |

LI= Leisure Involvement; SWB= Subjective well-being; LS= Life Satisfaction * $p < 0.05$
PA: positive affect; NA: negative affect

## DISCUSSION

The literature on the relationship between participation in recreational activities and well-being emphasises involvement (Ruuskanen & Ruoppila, 1995; Hassmen *et al.*, 2000; Resnick, 2000; Lu & Hu, 2005), and the social support that arises from leisure companionship (Wethington & Kessler, 1986; Coleman & Iso-Ahola, 1993; Iwasaki & Mannell, 2000). Stebbins (1992) state that serious leisure is characterised by sustained involvement and friendship as the basis of social support. This study also verified that the level of leisure involvement among slow pitch softball participants had a positive effect on well-being. Stebbins (1992) stress that leisure does not involve spending time on relaxing in meaningless activities, but instead involves systematic, goal-orientated participation in an enjoyable activity over a sustained period. When engaged in slow pitch softball, players with a higher level of leisure involvement are better able to overcome difficulties and achieve breakthroughs in the face of challenges, and strive to achieve greater knowledge, skill, and ability. They also find value from the activity to gain sustained benefits from their participation. The well-being that slow pitch softball players derive from their sport is evident in life satisfaction, positive affect and decrease of negative affect. Additionally, interaction with other participants places recreation and leisure at the centre of their lives and is an important source of happiness.

This study also found that spousal support moderates the positive relationship between leisure involvement and subjective well-being, meaning that when slow pitch softball participants receive stronger spousal support, the positive relationship between leisure involvement and subjective well-being is stronger. If participants with a high level of leisure involvement are considered through the concepts of „payment‟ and „benefit‟ as in social exchange theory, the process of sustained involvement can be regarded as the „payment‟, while the sustained gains for the individual can be regarded as „benefits‟. The „payments‟ made by participants with a high level of leisure involvement often cause family-leisure conflict (Goff *et al*., 1997). However, Goff *et al*. (1997) also found that spousal support moderated family-leisure conflicts that arise from high levels of leisure involvement. Moreover, various studies have demonstrated that participants with a high level of leisure involvement derive clear benefits from sustained participation in leisure activities (Russell, 1987; Bouchard *et al.*, 1994; Courneya & Hellsten, 1998; Gordon *et al.*, 2000). Accordingly, in making a sustained investment in a leisure activity, slow pitch softball players must constantly weigh the „payments‟ and „benefits‟ that are associated with their activity. A greater investment in the activity generates more benefits for the participant, but at the cost of potential family-leisure conflict. Spousal support is essential.

## CONCLUSIONS

This study draws two main conclusions. First, the degree of leisure involvement by slow pitch softball participants positively affects subjective well-being. Restated, when slow pitch softball participants have higher leisure involvement, they score more highly in subjective well-being, life satisfaction, positive affect and negative affect (reversed score). This finding confirms the results of previous studies of the effect of leisure involvement on subjective

well-being in the recreational activities (Ruuskanen & Ruoppila, 1995; Hassmen *et al*., 2000; Resnick, 2000; Lu & Hu, 2005). Second, spousal support moderated the relationship between leisure involvement and subjective well-being, meaning that when slow pitch softball participants received more spousal support, the positive relationship between leisure involvement and subjective well-being is stronger. Whereas Goff *et al*. (1997) focused on the effect of the pursuit of serious leisure on the family this study reveals that spousal support within the family moderated the subjective well-being of individuals with high levels of leisure involvement. For participants in slow pitch softball, gaining spousal support for their participation in the activity by effective communication can provide an incremental improvement in subjective well-being.

## LIMITATIONS AND FUTURE DIRECTIONS

Although this study elucidates the role played by spousal support in the relationship between leisure involvement and subjective well-being among slow pitch softball participants in Southern Taiwan, and the results have both favourable reliability and validity, it has several limitations.

(1) This study utilised a random sampling method to identify married slow pitch softball participants. Hence, the applicability of the survey results is necessarily limited.

(2) The study surveyed slow pitch softball participants, and its findings may not be generalisable to participants in other recreational activities. Follow-up investigations could survey participants in other recreational activities to extend the validity of the model.

(3) Only slow pitch softball participants in Southern Taiwan were surveyed. Those from other regions were excluded. Follow-up studies may extend the survey to participants in other regions to establish the geographical applicability of the research model.

(4) The study did not control for other influencing factors, such as individual factors (including socio-economic background, motivation, and personal characteristics), or factors related to the venue for participation. Future studies could consider these factors as control variables.

(5) Cross-sectional data were utilised to evaluate the moderating effect of spousal support.

However, Veiel (1987) showed that cross-sectional data frequently produced spurious interaction effects. Therefore, future research could consider adopting a longitudinal study design, measuring research variables at various times to establish the interaction of variables over time.

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# BYDRAE VAN ROLSTOELDANS TOT EMOSIONELE ONTWIKKELING VAN ROLSTOELGEBONDE LEERDERS

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***ABSTRACT***

*Wheelchair bound learners often experience low self-worth, feelings of inferiority and other negative emotions. This study investigates whether wheelchair dances can contribute to the emotional development of the wheelchair bound learner. Emotional and social development is construed as emotional intelligence. Emotional intelligence consists of intrapersonal intelligence, and social intelligence consists of interpersonal intelligence. The research question aimed to answer whether learners who participate in wheelchair dancing develop their intrapersonal capacities with specific regard to self-esteem, emotional self-awareness, assertiveness, independence and self-actualisation. A case study design with a mixed methods approach was followed in the study, including a qualitative enquiry and pre- and post-testing. The three participants were between the ages of 10 and 14 years. They participated in a minimum of 20 wheelchair dance classes over a period of nine*

*months. The results showed that although wheelchair dancing contributed to the emotional development of the participants, further development was evident in two of the participants with regard to their intrapersonal capacities. Participant 1 obtained positive post-test results in all five sub-components, while Participant 2 obtained positive post-test results in four sub-components and Participant 3 in two subcomponents.*

**Key words:** Wheelchair bound learners; Wheelchair dancing; Emotional development; Intrapersonal capacities; Interpersonal capacities.

## INLEIDING

Beide Christopher Reeve (2002) en Victor Frankl (2007), beklemtoon die vermoë van die menslike gees, as spirituele dimensie van die mens, tot transendensie van die menslike liggaam. Christopher Reeve, byvoorbeeld is verlam tydens ‟n perdry-ongeluk in 1995 en was as kwadrupleeg tot sy dood aan ‟n rolstoel gekluister. Sy bekende gesegde lui dat die liggaam nie die persoon is nie – dus, die mens se denke en gees transendeer die liggaam. Reeve se denke en gees was nie ingeperk deur sy rolstoel nie. Dit impliseer dat mense in rolstoele slegs probleme met fisiese beweging het en dat hulle denke en gees hierdie inperking kan oorskry. Die studie ondersoek die belangrikheid van deelname aan rolstoeldanse vir rolstoelgebonde leerders. “Rolstoelgebonde leerders” verwys na leerders wat van ‟n rolstoel afhanklik is vir voortbeweging en nie met ander hulpmiddels (soos krukke en looprame) onafhanklik kan loop nie. Die studie fokus nie op die rolstoelgebonde leerders se inperkings nie, maar op die ontwikkeling, wat (op ander vlakke as die liggaamlike) deur deelname aan rolstoeldans, in die

leerders kan plaasvind. Pieterse (2002) en Schiller (2009) wys op die belangrikheid van emosionele en sosiale ontwikkeling as ‟n noodsaaklike grondslag waarop ander ontwikkeling gegrond is. Volgens Smith en Krüger (2005) kan rolstoelgebonde leerders ‟n swak selfkonsep hê, aan gevoelens van minderwaardigheid ly en probleme met sosiale vaardighede toon. Hierdie het tot die navorsingsvraag gelei: Hoe kan rolstoeldans tot die emosionele ontwikkeling van rolstoelgebonde leerders bydra?

‟n Literatuursoektog na sistematiese ondersoeke oor “rolstoeldans en emosionele ontwikkeling” in die grootste akademiese biblioteek in Afrika het geen bronne opgelewer nie. Google Books bevat bronne oor rolstoeldans met enkele verwysings na emosionele ontwikkeling voordele, wat nie noodwendig op wetenskaplike navorsing gegrond is nie. Alhoewel daar min literatuur oor rolstoeldans en emosionele ontwikkeling is, is die positiewe verband tussen sport en sielkundige voordele reeds nagevors. (Rolstoeldans is ‟n internasionaal gevestigde sportsoort.) Haliimah (2010) dui die positiewe invloed aan wat sportdeelname op adolessente se emosionele ontwikkeling het. Hulle ervaar minder sosiale isolasie (Barber *et al.*, 2001; Antrobus, 2009; Jerstad *et al.*, 2010), omdat hulle meer sosiale verbindings het. Fisieke aktiwiteit kan depressie, negatiewe emosies en gevoelens van hartseer verminder (Brosnahan *et al.*, 2004; Jerstad *et al.*, 2010; Walsh, 2011), en selfkonsep verhoog (Taliaffero *et al.*, 2008; Jerstad *et al.*, 2010). Dit verminder angs (Taliaffero *et al.*, 2008) en stres (Calfas & Taylor, 1994; Sund *et al.*, 2011). Sport verbeter ook gedrag, byvoorbeeld afname in aggressie, wat weer lei tot groter selfwaarde (Donaldson & Ronan, 2006), en ‟n gevoel van trots op dit wat bereik is (Hays, 1999; Haliimah, 2010). Hierdie studie wil bepaal of die positiewe invloed wat sportdeelname op adolessente se emosionele

ontwikkeling het, ook op rolstoelgebonde leerders van toepassing sal wees.

De Klerk en Le Roux (2006) beskryf emosionele en sosiale ontwikkeling as emosionele intelligensie met intra- en interpersoonlike intelligensie as basis. Intrapersoonlike intelligensie is die identifisering, verstaan, kommunikasie en beheer van ‟n persoon se eie gedagtes en emosies, en interpersoonlike intelligensie is die mens se vermoë om met ander se emosies te kan identifiseer en empatie daarmee te toon (De Klerk & Le Roux, 2006). Ontwikkeling van die twee intelligensies stel die persoon in staat om sosiale vaardighede te toon. Gardner (in Strydom, 2005; Woolfolk, 2007; Cockcroft & Israel, 2009) onderskei intra- en interpersoonlike intelligensie as deel van veelvuldige intelligensies. Volgens Bar-On (2001) is daar ‟n positiewe verband tussen emosionele intelligensie en selfverwesenliking. Maslow (in Woolfolk, 2007) het die term, selfverwesenliking, gebruik om na selfvervulling en die verwesenliking van ‟n persoon se potensiaal te verwys. Soos Reeve en Frankl, erken Maslow ook die vermoë van die menslike gees om beperkings van die menslike liggaam die hoof te bied. Na aanleiding van hierdie teoretiese raamwerk is die volgende sekondêre vrae geformuleer:

1. Toon rolstoelgebonde leerders wat aan rolstoeldans deelneem, ontwikkeling ten opsigte van hulle intrapersoonlike vermoëns?
2. Beleef hierdie leerders groter selfverwesenliking na die rolstoel-dansklasse as voor die tyd?

Die vyf sub-komponente van intrapersoonlike vermoëns is volgens die Bar-On model (2004), die volgende:

- Selfagting – die mens se akkurate selfwaarneming, selfbegrip en selfaanvaarding;
- Emosionele selfbewussyn – die mens se gewaarwording van en begrip vir eie emosies;
- Selfhandhawing – die mens se effektiewe en konstruktiewe uitdrukking van hom-/haarself en sy/haar emosies;
- Onafhanklikheid – die mens se vermoë om op hom-/haarself staat te maak en om emosioneel onafhanklik van ander te wees;
- Selfverwesenliking – die mens se strewe na die bereiking van persoonlike doelwitte en die verwesenliking van eie potensiaal.

## PROBLEEMSTELLING

Die studie vind plaas binne die konteks van vroeë adolessente meisies (10-14 jaar) wat rolstoelgebonde is. Baie emosionele en sosiale veranderings kom in hierdie ontwikkelingsfase voor. Die selfkonsep, wat uit verskeie self-perspesies bestaan, verander. Die adolessent is meer selfbewus en onderskei tussen verskillende self-persepsies soos die liggaamsbeeld, selfbeeld (persepsie van die self), ideale self (hoe die self wil wees) en die sosiale self (persepsie van ander mense oor die self) (Williams, 2001). Namate die adolessent onafhanklik raak en ‟n self-identiteit ontwikkel, word die portuurgroep belangriker as die gesin (Furman & Buhrmester in La Greca & Harrison, 2005). Aanvaarding deur die portuurgroep vorm ‟n belangrike deel van die adolessent se self-identiteit (Harter in La Greca & Harrison, 2005). Met verwysing na die rolstoelgebonde adolessent beweer Marshak (in Berger, 2009), dat aanvaarding die adolessent pantser teen mense se ongunstige reaksies en help om selfkonsep te versterk. Volgens Marshak (in Berger, 2009) moet die gestremdheid nie as ‟n devaluerende aspek in die self-identiteit geïntegreer word nie; alhoewel dit nie

ontken word nie, speel dit ook nie ‟n deurslaggewende rol nie (Watson in Berger, 2009).

Shields *et al.* (2006) het ses studies oor die selfkonsep van kinders met serebrale gestremdheid krities beskou. Volgens hulle het adolessente meisies wat serebraal gestremd is, laer self-persepsies (soos fisieke voorkoms en sosiale aanvaarding) in vergelyking met adolessente meisies wat nie gestremd is nie. Hulle beveel gepaste intervensies vir hierdie groep meisies aan (Shields *et al.*, 2006), sonder om enige intervensie te spesifiseer. Rolstoeldans as intervensie word in hierdie studie ondersoek.

Die term, rolstoeldans, verwys in hierdie studie na ‟n bewegingsaktiwiteit waaraan rolstoelgebonde leerders deelneem en een of albei van die dansmaats, rolstoelgebonde is. ‟n Rolstoel vorm dus altyd deel van hierdie danspare se optredes. Vir die doeleindes van hierdie studie vereis rolstoeldans dat daar met ‟n maat gedans word.

## METODOLOGIE

Die navorsingsparadigma vir die studie is konstruksionisties met interpretasie as subjektiewe tweede-orde-teorie. Maree en Van der Westhuizen (2007) noem dat konstruktivisme nie net een realiteit impliseer nie, maar veelvuldige realiteite soos dit deur die deelnemers saamgestel word. Interpretivisme word verbind met die werk van Weber (1864-1920) wat voorstel dat sosiale wetenskappe eerder verbind word met verstaan (“verstehen”) as met verduidelik

(“erklären”) (Blaxter *et al.*, 2001). Die gevalle studie-ontwerp is interaktief aangesien die fenomeen nie geredelik van die konteks geskei kan word nie. ““n Sentrale aksioom van interpretivistiese navorsing is om met data in konteks te werk. Die uitdaging lê dan daarin om data op so ‟n manier te versamel dat dit makliker is om die fenomeen in sy ware konteks te leer ken” (Nel, 2004:33,34). Die hoofsaaklik kwalitatiewe benadering in die studie word deur ‟n kwantitatiewe komponent, as basislyn assessering en meetinstrument, aangevul. Die veelmetode strategie het ‟n in-diepte begrip (“verstehen”) van die navorsingsvrae ten doel.

‟n Etiese klaringsertifikaat met klaringsnommer, 2011/8573018/005, is deur die Universiteit van Suid-Afrika uitgereik om die studie te kon onderneem.

### Deelnemers

‟n Gerieflikheid steekproefneming is gebruik om ‟n groep van 3 vroulike, rolstoelgebonde deelnemers tussen die ouderdomme van 10 en 14 jaar te selekteer wat nog nie tevore aan rolstoeldans deelgeneem het nie. Die rolstoel-dansklasse is by die skool wat die deelnemers bywoon, aangebied.

Deelnemer 1 (14 jaar oud) is op 2-jarige ouderdom gediagnoseer met simmetriese polineuropatie wat geleidelik vererger het. Sy kon aanvanklik onafhanklik rondbeweeg, maar beweeg sedertdien met behulp van ‟n elektriese rolstoel. Deelnemer 2 (10 jaar oud) is gediagnoseer met ‟n statiese spierversteuring, kongenitale strukturele miopatie, wat algehele spierswakheid tot gevolg het. Sy is rolstoelgebonde en het nie onafhanklike kop beheer nie. Sy gebruik haar voet om op ‟n aangepaste rekenaar te werk en beheer ook haar elektriese rolstoel met haar voet. ‟n Voltydse helper staan haar by met voeding, toilet roetines, en ander behoeftes. Sy moet ook in die nag omgedraai word in haar bed. Deelnemer 3 (10 jaar oud) is ‟n rolstoelgebonde, serebraal-gestremde meisie met chorea-atetose. Sy benodig baie

proksimale stabiliteit (kop- en rompbeheer) om aktiwiteite met haar arms en bene uit te voer. Alhoewel sy sag praat weens swak asembeheer, kan sy haarself meestal verstaanbaar uitdruk.

**Intervensie: Rolstoel-dansklasse**

Een rolstoel-dansklas van 45 minute is weekliks deur ‟n rolstoel-dansinstruktrise, ‟n internasionaal gekwalifiseerde dansafrigter, aan die deelnemers by hul skool aangebied. Die ondersoek is oor ‟n tydperk van 9 maande gedoen, terwyl die deelnemers aan ‟n minimum van 20 rolstoel-dansklasse deelgeneem het.

**Data-insamelingsinstrumente en toepassing**

Die volgende kwalitatiewe en kwantitatiewe data-insamelingsinstrumente is gebruik: observasie, semi-gestruktureerde onderhoude, collage-aktiwiteite, metafoor-onderhoude en die *Piers-Harris Children"s Self-Concept Scale, Second Edition* (Piers-Harris 2) vraelys.

***Kwalitatiewe data-insameling***

*Observasie.* Weeklikse observasie wat in veld notas vervat is, is vir ‟n tydperk van 9 maande by die rolstoel-dansklasse gedoen.

*Semi-gestruktureerde onderhoude.* In totaal is 9 semi-gestruktureerde onderhoude met die deelnemers wat aan die rolstoel-dansklasse deelgeneem het, met hulle ouers, hulle klasonderwysers, asook die rolstoel-dansinstruktrise na afloop van die rolstoel-dansklasse en -danskompetisie gevoer. (Twee deelnemers het dieselfde klasonderwyser gehad.) Die deelnemers het aan die einde van die rolstoel-dansklasse aan ‟n jaarlikse rolstoel-danskompetisie deelgeneem wat nie deel van die oorspronklike beplanning uitgemaak het nie.

*Collage-aktiwiteite.* Collage, as projeksie-tegniek, is gebruik om inligting oor die deelnemers se persepsies van hulle eie en ander se emosies te verkry. ‟n Projeksie medium is ’n verkenningshulpmiddel waardeur toegang tot die kind se innerlike wêreld verkry kan word. Dit wat die deelnemer nie in woorde kan uitdruk nie, kry vorm in haar onbewustelike projeksies: haar “wense, vrese, konflikte, spanning, [en] angs” (Du Toit & Jacobs in Breytenbach, 2009:10).

’n Groot verskeidenheid prente (sonder spesifieke temas) uit verskillende tydskrifte is vir die collage-aktiwiteite gebruik. Die aktiwiteite is individueel met die deelnemers uitgevoer. Die betrokke deelnemer moes na al die prente kyk en prente uitkies wat uitbeeld hoe sy op ’n gegewe tydstip gevoel het. Indien die deelnemer se handfunksie dit vir haar moeilik gemaak het om die prente self uit te knip of te plak, is hulp verleen. Die deelnemer het egter self aangedui in watter volgorde en waar op die A4-bladsy die prente geplak moes word. Navraag is oor elke prent gedoen. Collage-aktiwiteite is as voor-toets voor die aanvang van die rolstoel-dansklasse en as na-toets na afloop van die dansklasse gedoen.

*Metafoor-onderhoude.* Metafoor-onderhoude, as vergelykingsbeeldspraak, is as voor- en na-toets gebruik om inligting oor die deelnemers se gedagtes, emosies, houdings en persepsies ten opsigte van deelname aan rolstoeldans te verkry. Daar is bepaal met watter dier (of diere) die deelnemers hulleself voor hulle deelname aan die rolstoeldanse en sedert hulle deelname aan rolstoeldans geïdentifiseer het, en die rede(s) vir hulle keuse. Diere kom (as simbole) in alle kulture voor en manifesteer as mites, sprokies, gesegdes en fabels. Nyabadza (2009)

beskou die metafoor as 'n effektiewe instrument waardeur emosionele reaksie by mense opgeroep en dieper betekenisse daaromtrent aan ander oorgedra kan word. Volgens Mercer (2011:2,3) se beskrywing kan inligting oor die tipe dier waarmee die deelnemers hulle vereenselwig, na 'n ander domein (hulle gedagtes, emosies, houdings en persepsies) oorgedra word: "The use of metaphor is based on a transfer of information from one domain to another (*metaphora* = transfer). One cognitive domain is understood in terms of another through the process of mapping from the better understood to the less understood domain." Marshall (in Maccani, 2005:237) wys op die "comparison between two unlike objects which have at least one characteristic in common" wat inligting oor die deelnemers se gedagtes, emosies, houdings en persepsies ten opsigte van hulle deelname aan rolstoeldans kan oplewer. Wanneer deelnemers hulleself met die beeld van 'n spesifieke dier in verband bring, verbind hulle hulleself eintlik met sy betekenisvolle en kenmerkende eienskappe en simboliese betekenis. Navraag is oor die metafoor gedoen.

***Kwantitatiewe data-insameling***

Alhoewel daar nie 'n psigometriese instrument is wat die selfkonsep van rolstoelgebonde leerders meet nie, word Llewellyn en Chung (1997) se aanbevelings gevolg. Hulle beveel aan

dat data-insameling, indien moontlik, veelvuldige bronne (bv. ouers, onderwysers en kinders), asook verskeie instrumente (soos vraelyste, onderhoudvoering en observasie) moet insluit (Llewellyn & Chung, 1997).

*Piers-Harris Children"s Self-Concept Scale, Second Edition* (Piers-Harris 2) is 'n gestandaardiseerde data-insamelingsinstrument (Piers & Herzberg, 2002), en fokus op die bewustelike selfpersepsies en selfevaluerende eienskappe en gedrag wat met die selfkonsep van 'n individu verband hou. Dit is geskik om die "self-concept of young people with physical disabilities [that] is especially subject to change through determination [and] persistence" tydens rolstoeldans te bepaal (Llewellyn & Chung, 1997:267). Die vraelys berus op 'n geforseerde ja/nee-keuseformaat en onderskei tussen 6 sub-skaaltellings van die selfkonsep afgesien van 'n totale indeks of van die selfkonsep. Die volgende domeine word in die sub-skaaltellings ingesluit: Gedragsaanpassing *(BEH),* Intellektuele en skoolstatus *(INT),* Fisieke voorkoms en kenmerke *(PHY),* Vry van angs *(FRE),* Populariteit *(POP),* en Geluk en tevredenheid *(HAP).* Die twee geldigheid skale behels die Inkonsekwente Responsindeks *(INC)* wat lukraak responspatrone identifiseer en die Responsvooroordeel-indeks *(RES)* wat meet of die kind antwoord sonder inagneming van die item se inhoud. Die betroubaarheidskoëffisiënte van die Piers-Harris 2 vergelyk goed met ander meetinstrumente wat vir die evaluering van selfkonsep gebruik word (Piers & Herzberg, 2002) met Cronbach alpha-waardes van 0.91 vir die totale indeks, 0.81 vir Gedragsaanpassing, 0.81 vir Intellektuele en skoolstatus, 0.75 vir Fisieke voorkoms en kenmerke, 0.81 vir Vry van angs, 0.74 vir Populariteit en 0.77 vir Geluk en tevredenheid.

Die Piers-Harris 2 bied, as voor- en na-toets, 'n basislyn assessering vir die deelnemers se emosionele ontwikkeling ten opsigte van selfkonsep. Die vraelys is individueel aan elke deelnemer voorgelees. Vanweë die eenvoudige taal vlak is die vraelys in Engels afgeneem omdat die deelnemers vaardig in Engels was wat hulle tweede taal op skool is. Hul response is op die toetsblad namens hulle omkring as gevolg van die deelnemers se fisieke inperkings.

**Data-analise**

Al die onderhoude is op band opgeneem en verbatim getranskribeer. Gedetailleerde beskrywings van die deelnemers se nie-verbale kommunikasie en gedrag is ingesluit. Ter wille van volledige rekordhouding en interne geldigheid, is beide die transkripsies van onderhoude en refleksie op die veldnotas so gou moontlik na afloop van elke aktiwiteit gedoen. Areas waaroor onduidelikheid bestaan het, is met die betrokke deelnemers uitgeklaar. 'n Inhoudsanalise van al die onderhoude en veld notas is gedoen deur die data te kodeer (vooraf-, *in vivo*, proses- en beskrywende kodering), en in verskillende kategorieë te organiseer om verhoudings of patrone tussen die kategorieë te identifiseer na aanleiding van die 5 sub-komponente van intrapersoonlike vermoëns. Die analitiese instrument was hoofsaaklik vergelyking.

Die interpretasie van die collage-aktiwiteite en metafore is oorwegend blindweg deur 'n geregistreerde opvoedkundige sielkundige gedoen wat geen agtergrondskennis van die deelnemers gehad het nie, maar bekend was met die doel van die studie.

Elke deelnemer se Piers-Harris 2-routellings is tot genormaliseerde T-tellings verwerk en volgens Piers en Herzberg (2002) se riglyne geïnterpreteer. Elke deelnemer se voor- en na-

toets resultate is individueel vergelyk. Die deelnemers is nie met mekaar vergelyk nie. Hierdie data is nie in isolasie geïnterpreteer nie, maar soos Piers en Herzberg voorstel, is dit teen die ander data geverifieer.

## RESULTATE

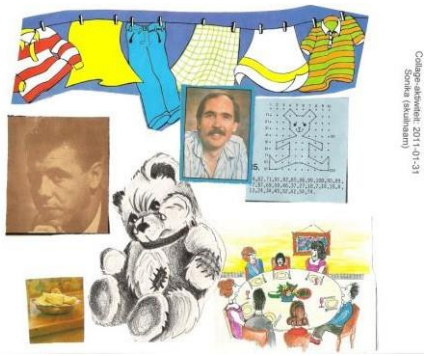
Die resultate word tematies bespreek volgens die deelnemers se emosionele ontwikkeling wat sedert hulle deelname aan rolstoel-dansklasse plaasgevind het.

### Aggressie en hartseer teenoor geluk en selfverwesenliking

- "n Aggressiewe vrou ("*Die vrou is kwaad. Ek was somtyds hartseer*.")
- "n Vrou in 'n rolstoel wat mense toespreek ("*Soos sy sit in die rolstoel, sit ek ook in die rolstoel.*")
- Drie volwasse vrouens wat mekaar omarm ("*Hulle is vrinne. Ek gesels ook met my vrinne*.")
- "n Man en 'n seun wat voor 'n rekenaar sit ("*Net soos die man, moet ek ook altyd op die rekenaar werk in die sport-periode*.")
- "n Gebreide figuur met 'n ongelukkige uitdrukking ("*Hy"s ook hartseer en kwaad.*")


Die voor-toets-collage bevat die volgende prente en response op die navraag word tussen aanhalingstekens aangedui.

***FIGUUR 1*: VOOR-TOETS-COLLAGE: DEELNEMER 1**




- ˝n Wasgoedlyn waaraan wasgoed hang (“*Ek wou klere gehad het, en toe sê mamma, maar daar is nie klere nie.*”)
- ˝n Verbind-die-kolletjies-prent (“*Ek kies die „games", want dis al wat ek aanmekaar kan speel.*”)
- ˝n Man wat lyk asof hy dink (“*Hy dink ... ek dink ... ek wil nie meer „games" speel nie. Ek wil ˝n slag iets anders doen. Ek is moeg van „games" speel.*”)
- ’n Bordjie met beskuit (“*Ek het lus vir iets ... lekkers.*”)
- ˝n Man wat glimlag (“*Ek was bly oor enigiets om aan deel te neem. Daar was niks anders nie. Die man het maar net gelag en gesê ... dis nou ekke ... ék „worry" nie ... hulle wil nie vir my help nie ... ek gaan maar weer „games" speel.*”)
- Mense wat om ˝n tafel sit en eet (“*Want ek was al so desperaat dat ek al vir my familie ook gevra het ... het julle nie gehoor van ˝n ander sports nie?”*)
- ˝n Teddiebeer wat huil (“*Die beertjie huil. Ek huil ook, want ek wil aan iets anders deelneem as „games". Toe˝t ek gehoor daar is niks anders om te doen as „games" nie. Toe gaan ek in my kamer en ek huil.* [’n Rukkie stilte] ... *Dis nie vir my lekker by die huis nie. Daar˝s nie kinders wat soos ek is nie. Daar˝s net kinders wat kan loop en ek het nie die stoel by die huis nie* [sy verwys hier na haar elektriese rolstoel waarmee sy self by die skool rondbeweeg, maar die stoel bly by die skool; sy gaan nie daarmee huis toe nie].)

Die voor-toets-collage bevat die volgende prente en response op die navraag word tussen aanhalingstekens aangedui:

## *FIGUUR 2*: VOOR-TOETS-COLLAGE: DEELNEMER 2


- ˝n Jong bokkie wat aan ˝n persoon se vinger suig (“*Hy˝s kwaad. Die bokkie is kwaad. Hy byt die vinger.*”)
- Vader Kersfees by ˝n voertuig waarop takbokke voorop gemonteer is (“*Hy˝s ongelukkig. Vader Krismis deel sy bokkies uit aan die mense. Hy voel hartseer.*”)
- ˝n Man wat by ˝n lessenaar sit en skryf met boeke in die voorgrond (“*Hy˝s kwaad. Sy werk is te veel.*”)
- ˝n Profiel van ’n man met ˝n donkerbril op wat afkyk grond toe (“Die man is hartseer.”)
- ˝n Man wat glimlaggend saam met ’n aap wat klere aan het, vir die kamera poseer (“Ek voel soos die apie. Hy˝s kwaad.”)
- ˝n Man met lang hare wat in ˝n rolstoel sit met ˝n hond op sy skoot (“Sy sit ook in die rolstoel.”)

Die voor-toets-collage bevat die volgende prente en response op die navraag word tussen aanhalingstekens aangedui:

***FIGUUR 3*: VOOR-TOETS-COLLAGE: DEELNEMER 3**

Deelnemer 1 se voor-toets-collage beeld beide aggressie en hartseer 2 keer uit (sien Figuur 1). Dieselfde temas word in Deelnemer 3 se voor-toets-collage herhaal – aggressie kom 4 keer voor en hartseer 2 keer (sien Figuur 3). Deelnemer 2 se voor-toets-collage (sien Figuur 2) beeld hartseer uit alhoewel sy voorgee dat dit nie saak maak as sy net dieselfde aktiwiteite of „games‟ herhaaldelik moet doen nie (“ék „worry‟ nie”). Dit word egter weerspreek deur haar opmerking: “Want ek was al so desperaat dat ek al vir my familie ook gevra het ... het julle nie gehoor van ŉ ander sports nie?” Die voor-toets-metafore bevestig die temas van aggressie en hartseer. Deelnemer 1 se voor-toets-metafoor is ŉ leeu wat “tekere gaan” as hy kwaad is en Deelnemer 3 is ŉ leeu wat gevaarlik is. Deelnemer 2 is ŉ hondjie wat hartseer is en ‟n been soek.

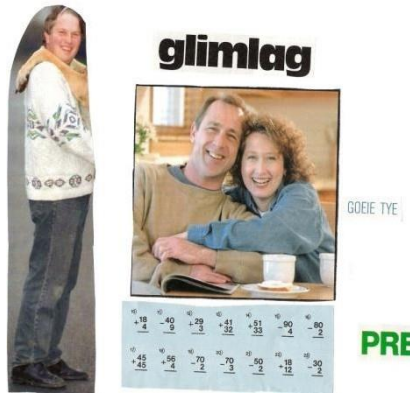
Daar was gewoonlik ŉ opgeruimde en ontspanne atmosfeer in die rolstoel-dansklasse. Die deelnemers het dit geniet en al 3 se na-toets-collages maak melding van hulle geluk na afloop van die rolstoeldans – die woord “gelukkig” kom 7 keer voor. Deelnemer 1 sê: “Ek is gelukkig, want nou kan ek dans” (Figuur 4.) Ander woorde soos “bly”, “glimlag”, “goeie tye” en “pret” wat met geluk verband kan hou, kom ook op die collages voor (Figure 4-6).

Deelnemer 2 se na-toets-metafoor is ŉ perd wat bly en opgewonde is en elke keer spring. Deelnemer 3 verander van ŉ gevaarlike leeu in ŉ vriendelike katjie wat minder aggressie en meer geluk weerspieël.


- Die woord “gelukkig” (“*Ek is gelukkig, want nou kan ek dans”*)
- ‟n Skoenlapper wat op ‟n blom sit (“*Nou ... is ek ... rondvlieg ... bly.*”)
- ‟n Man in ŉ rolstoel wat kos op ŉ stoof kook terwyl ŉ helper byderhand is (“*Die man is in die rolstoel en hy kook. Jy kan alles ... enigiets, alles ... al is jy in ŉ rolstoel.*”)
- ‟n Blompot met sonneblomme (“*Ek kies die blom prent, want nou is ek tussen die ander blomme en voel nie meer alleen nie.*”)
- Twee dogtertjies wat hande vashou (“*Jy kan sien hulle twee is gelukkig. En ek is ook gelukkig om met my „partner”* [verwysing na dansmaat] *saam gelukkig te wees.*”)

Die na-toets-collage bevat die volgende prente en response op die navraag word tussen aanhalingstekens aangedui.

***FIGUUR 4*: NA-TOETS-COLLAGE: DEELNEMER 1**

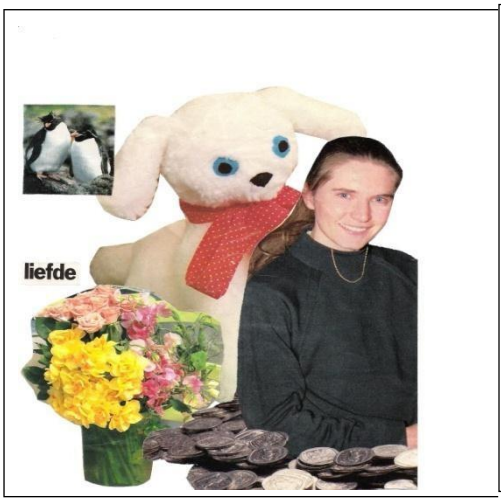



- Die woorde "glimlag", "goeie tye" en "pret".
- ‟n Man by ’n reuse hond wat met sy pote op die man se skouers staan (*"Want hy [die man] is gelukkig."*)
- ‟n Man en ’n vrou wat in ‟n omhelsing vir die kamera glimlag (*"Want hulle glimlag en is bly."*)
- Verskeie wiskundige bewerkings (*"Die somme maak my net so gelukkig soos die danse."*)

Die na-toets-collage bevat die volgende prente en response op die navraag word tussen aanhalingstekens aangedui.

***FIGUUR 5*: NA-TOETS-COLLAGE: DEELNEMER 2**

Deelnemer 1 verwoord haar selfverwesenliking tydens die na-toets-collage soos volg: "Jy kan alles ... enigiets, alles [doen] ... al is jy in ’n rolstoel." Sy bevestig dit ook deur haarself in die na-toets-collage uit te beeld as ’n skoenlapper wat kan rondvlieg (Figuur 4) en deur haar na-toets-metafoor wat ’n skoenlapper is "want hy vlieg oral waar hy wil kom". Dit word bevestig deur die Gedragsaanpassing-sub-skaal van die Piers-Harris 2 wat van gemiddeld na bo-gemiddeld styg (Tabel 1).




- Die woord "liefde".
- Twee pikkewyne wat teenaan mekaar staan (*"Pikkewyne ... is ook gaaf."*)
- ‟n Sagte speelding wat soos „n teddiebeer lyk (*"Hy lyk mooi."*)
- ‟n Blompot met blomme ("*Want dit is so mooi*.")
- ‟n Glimlaggende vrou met baie muntstukke rondom haar ("*Sy voel gelukkig*.")

Die na-toets-collage bevat die volgende prente en response op die navraag word tussen aanhalingstekens aangedui.

***FIGUUR 6*: NA-TOETS-COLLAGE: DEELNEMER 3**

***TABEL 1*: DEELNEMER 1: SELFKONSEP PIERS-HARRIS 2 VOOR- EN NA-TOETS**

| | | VOORTOETS | NATOETS |
|---|---|---|---|

| | | Routelling | T-telling | Interpretasie van T-tellings | Routelling | T-telling | Interpretasie van T-tellings |
|---|---|---|---|---|---|---|---|
| | BEH | 13 | 54 | Gemiddeld | 14 | 62 | Bo-gemiddeld |
| | INT | 13 | 51 | Gemiddeld | 12 | 48 | Gemiddeld |
| | PHY | 8 | 48 | Gemiddeld | 7 | 45 | Gemiddeld |
| | FRE | 9 | 46 | Gemiddeld | 7 | 41 | Laag-gemiddeld |
| | POP | 10 | 54 | Gemiddeld | 7 | 44 | Laag-gemiddeld |
| | HAP | 9 | 51 | Gemiddeld | 9 | 51 | Gemiddeld |
| | **TOT** | 46 | 49 | Gemiddeld | 42 | 46 | Gemiddeld |
| **Geldig-heid** | **INC** | 0 | 43 | Normaal | 2 | 60 | Normaal |
| | **RES** | 27 | 48 | Normaal | 27 | 48 | Normaal |

BEH=Gedragsaanpassing; INT=Intellektuele & skoolstatus; PHY=Fisieke voorkoms & kenmerke; POP= Populariteit; HAP=Geluk & tevredenheid; INC=Inkonsekwente responsindeks; RES= Responsvooroordeel-indeks

***TABEL 2*: DEELNEMER 2: SELFKONSEP PIERS-HARRIS 2 VOOR- EN NA-TOETS**

| | | **VOORTOETS** | | | **NATOETS** | | |
|---|---|---|---|---|---|---|---|
| | | Routelling | T-telling | Interpretasie van T-tellings | Routelling | T-telling | Interpretasie van T-tellings |
| **Selfkonsep** | BEH | 13 | 54 | Gemiddeld | 14 | 62 | Bo-gemiddeld |
| | INT | 15 | 59 | Bo-Gemiddeld | 15 | 59 | Bo-gemiddeld |
| | PHY | 8 | 48 | Gemiddeld | 11 | 65 | Bo-gemiddeld |
| | FRE | 11 | 51 | Gemiddeld | 12 | 54 | Gemiddeld |
| | POP | 8 | 47 | Gemiddeld | 9 | 50 | Gemiddeld |
| | HAP | 8 | 47 | Gemiddeld | 10 | 59 | Bo-gemiddeld |
| | **TOT** | 48 | 51 | Gemiddeld | 55 | 61 | Hoog |
| **Geldig-heid** | **INC** | 1 | 53 | Normaal | 2 | 60 | Normaal |
| | **RES** | 27 | 48 | Normaal | 28 | 50 | Normaal |

BEH=Gedragsaanpassing; INT=Intellektuele & skoolstatus; PHY=Fisieke voorkoms & kenmerke; POP= Populariteit; HAP=Geluk & tevredenheid; INC=Inkonsekwente responsindeks; RES= Responsvooroordeel-indeks

***TABEL 3*: DEELNEMER 3: SELFKONSEP PIERS-HARRIS 2 VOOR- EN NA-TOETS**

| | | **VOORTOETS** | **NATOETS** |
|---|---|---|---|

| | | Routelling | T-telling | Interpretasie van T-tellings | Routelling | T-telling | Interpretasie van T-tellings |
|---|---|---|---|---|---|---|---|
| | BEH | 12 | 49 | Gemiddeld | 14 | 62 | Bo-gemiddeld |
| | INT | 14 | 54 | Gemiddeld | 11 | 46 | Gemiddeld |
| | PHY | 10 | 58 | Bo-gemiddeld | 8 | 48 | Gemiddeld |
| | FRE | 11 | 51 | Gemiddeld | 11 | 51 | Gemiddeld |
| | POP | 7 | 44 | Laag-gemiddeld | 9 | 50 | Gemiddeld |
| | HAP | 9 | 51 | Gemiddeld | 10 | 59 | Bo-gemiddeld |
| | **TOT** | 48 | 51 | Gemiddeld | 48 | 51 | Gemiddeld |
| **Geldig-heid** | **INC** | 0 | 43 | Normaal | 0 | 43 | Normaal |
| | **RES** | 31 | 56 | Normaal | 25 | 43 | Normaal |

BEH=Gedragsaanpassing; INT=Intellektuele & skoolstatus; PHY=Fisieke voorkoms & kenmerke; POP= Populariteit; HAP=Geluk & tevredenheid; INC=Inkonsekwente responsindeks; RES= Responsvooroordeel-indeks

Deelnemer 3 se geluk word ook ondersteun deur die Populariteit-sub-skaal van die Piers-Harris 2 omdat sy meer sosiale aanvaarding beleef waar dit van laag-gemiddeld na gemiddeld gestyg het. Deelnemers 2 en 3 se geluk word bevestig deur die Geluk en Tevredenheid-sub-skaal wat van gemiddeld na bo-gemiddeld styg (Tabelle 2 & 3).

**Negatiewe teenoor positiewe emosionele selfbewussyn en selfagting**

Deelnemer 2 sê in die voor-toets-collage dat sy nie meer „games‟ wil speel nie. Sy is moeg daarvoor en wil ““n slag iets anders doen”. Toe sy hoor “daar is niks anders om te doen as „games‟ nie”, het sy in haar kamer gaan huil – “hulle wil nie vir my help nie”. Sy was “desperaat” en het haar gesin gevra of hulle nie weet van iets anders wat sy kan doen nie (sien Figuur 2). Volgens Deelnemer 1 moet sy “ook altyd op die rekenaar werk in die sportperiode” (Figuur 1). Alhoewel al 3 deelnemers met die rolstoel identifiseer in die voor-toets-collages (Figure 1 tot 3), spreek Deelnemer 2 ’n behoefte uit aan identiteits-ontwikkeling en sosiale kontak met ander kinders in rolstoele: “Dis nie vir my lekker by die huis nie. Daar‟s nie kinders wat soos ek is nie. Daar‟s net kinders wat kan loop” (Figuur 2). Sy is soekend, net soos die hondjie van haar voor-toets-metafoor.

Na afloop van die rolstoeldanse is Deelnemer 1 “nou … tussen die ander blomme en voel [sy] nie meer alleen nie”. Sy is “ook gelukkig om met my „partner‟ [verwysing na dansmaat] saam gelukkig te wees” (Figuur 4). Die deelnemers het al hoe meer met mekaar en met die rolstoel-dansinstruktrise gekommunikeer. Al 3 deelnemers beleef ’n meer positiewe emosionele selfbewussyn na aanleiding van woorde soos “gelukkig”, “bly” en “liefde” op die na-toets-collages (Figure 4 tot 6) asook “opgewonde” volgens die na-toets-metafoor van Deelnemer 2. Die positiewe emosies wat as ontwikkeling ten opsigte van hulle emosionele selfbewussyn beskou word en tot verbeterde gedragsaanpassing lei, word by al 3 deelnemers bevestig deur die Gedragsaanpassing-sub-skaal van die Piers-Harris 2 wat van gemiddeld na bo-gemiddeld styg (Tabelle 1 tot 3).

Na afloop van die rolstoeldanse styg Deelnemer 1 se selfagting want sy kan "enigiets" doen (Figuur 4). Sy is ook nie meer 'n leeu wat "te kere" hoef te gaan nie (voor-toets-metafoor), maar 'n skoenlapper (na-toets-metafoor) wat "tussen die ander blomme" hoort (Figuur 4). Deelnemer 2 se metafore verander van 'n klein honger hondjie na 'n groot perd wat spring, terwyl Deelnemer 3 nie meer haarself as 'n gevaarlike leeu teen gevare hoef te beskerm nie, maar 'n sagte klein katjie word.

## BESPREKING

Die resultate van die deelnemers word volgens die sub-komponente van die selfkonsep (Bar-On, 2004) bespreek om die ontwikkeling van hulle **intrapersoonlike vermoëns** sedert hulle deelname aan die rolstoeldanse aan te dui.

### *Selfagting*

Twee deelnemers toon ontwikkeling ten opsigte van hulle selfagting. Hulle selfaanvaarding is meer positief sedert hulle deelname aan rolstoeldans. Volgens Donaldson en Ronan (2006) bewerkstellig sport 'n groter waardering vir die self. Deelnemer 1 vergelyk haarself met 'n skoenlapper wat oral vlieg waar hy wil wees en iemand wat "enigiets, alles" kan doen.

Deelnemer 2 se totale selfkonsep-telling op die Piers-Harris 2 na-toets-resultate verbeter van gemiddeld na hoog wat ooreenstem met Taliaffero *et al.* (2008) en Jerstad *et al.* (2010) se bevindings. Deelnemer 2 se metafore verander van 'n soekende (met ander woorde onbevredigde behoefte), hondjie na 'n perd wat spring – sy beeld haarself nou met kragtigheid en beweeglikheid uit. Beide deelnemers se metafore bevat 'n kinetiese element of beweeglikheid wat heel waarskynlik met die rolstoeldanse verband hou. Die klasonderwyser gebruik die woord "vermag" om die sukses van die rolstoeldanse aan te dui: "... net die idee dat hulle absoluut self iets kon vermag". Volgens haar verbeter die deelnemers se selfagting omdat "daar dinge [is] wat hulle kan doen, wat die ander nie kan doen nie". Hays (1999) en Haliimah (2010) wys ook daarop dat sport bydra tot 'n gevoel van trots op dit wat bereik (of vermag) is.

### *Emosionele selfbewussyn*

Al drie deelnemers toon gewaarwording van meer positiewe emosies. Volgens Brosnahan *et al.* (2004), Jerstad *et al.* (2010) en Walsh (2011) kan fisieke aktiwiteit depressie, negatiewe emosies en gevoelens van hartseer verminder. Ontwikkeling ten opsigte van die deelnemers se emosionele selfbewussyn lei tot verbeterde gedragsaanpassing (Donaldson & Ronan, 2006). Deelnemer 1 was voor haar deelname aan rolstoeldans geneig tot humeur- en emosionele uitbarstings, soos 'n leeu wat "te kere gaan" as hy kwaad is volgens haar metafoor. Haar ma bevestig tydens die onderhoud dat haar humeur- en emosionele uitbarstings afgeneem het sedert haar deelname aan rolstoeldans. Donaldson en Ronan (2006) noem dat sportdeelname aggressie verminder. Die Gedragsaanpassing-sub-skaal van die Piers-Harris 2 bevestig die verbetering met 'n telling wat van gemiddeld na bo-gemiddeld styg.

Deelnemer 2 beeld haar emosionele selfbewussyn ook meer positief in die na-toets-metafoor uit. Sy is nou bly en opgewonde in teenstelling met hartseer in die voor-toets-metafoor. Volgens Brosnahan *et al.* (2004) verminder fisieke aktiwiteit gevoelens van hartseer. Haar positiewe emosionele selfbewussyn word bevestig deur die na-toets-collage, die Piers-Harris

2-natoets se Gedragsaanpassing-sub-skaal wat van gemiddeld na bo-gemiddeld styg, en die onderhoud waar sy haar gevoelens sedert haar deelname aan rolstoeldanse as "gemaklik, lekker, bly en opgewonde" beskryf.

Deelnemer 3 se voor-toets-collage verander van woede en aggressie teenoor mense (die bokkie byt iemand se vinger in Figuur 3) na meer positiewe emosies soos liefde en geluk op die na-toets-collage. Die Gedragsaanpassing-sub-skaal van die Piers-Harris 2 bevestig die positiewe gedragsaanpassing met ‟n telling wat van gemiddeld na bo-gemiddeld styg. So ook verander die metafoor van ‟n gevaarlike leeu na ‟n vriendelike katjie.

***Selfhandhawing***

Een deelnemer het ontwikkeling ten opsigte van selfhandhawing getoon. Alhoewel die opmerking nie direk op die effektiewe uitdrukking van emosies dui nie, sou dit daarmee in verband gebring kan word. Deelnemer 1 beweer tydens die na-toets-collage dat ‟n persoon in ‟n rolstoel "enigiets, alles" kan doen. Die rolstoel begrens ook nie haar identiteit nie (Watson in Berger, 2009). Met haar humeur- en emosionele uitbarstings in gedagte, is denkbeeldige situasies soos afknouery en verontregting in die onderhoud bespreek. Sy kon al die potensiële

konfliksituasies ontlont. Deelnemer 2 druk egter nie haar emosies konstruktief uit nie: "Ek speel net, dan voel ek weer reg". Ontkenning waar sy voorgee dat dit haar nie pla as sy dieselfde aktiwiteite herhaaldelik moet doen nie, is reeds bespreek.

***Onafhanklikheid***

Twee deelnemers het ontwikkeling ten opsigte van onafhanklikheid getoon. Hulle kan op hulleself staatmaak en emosioneel onafhanklik van ander wees. Williams (2001) verwys na die adolessent se behoefte aan onafhanklikheid. Deelnemer 1 se na-toets-collage wys dat haar geluk in haarself setel: "Ek is gelukkig, want nou kan ek dans." Dit word ook tydens die onderhoud bevestig.

Deelnemer 2 sê tydens die onderhoud dat sy kan "ballroom" dans sonder dat iemand haar hoef te help. Dis ‟n groot mylpaal vir iemand wat ’n voltydse helper het. Haar klasonderwyser maak ook melding daarvan. Deelnemer 2 se na-toets-collage dui op minder emosionele afhanklikheid van ander: "Die somme maak my net so gelukkig soos die danse". Haar wiskunde het waarskynlik verbeter as gevolg van die tydmate wat afgetel word tydens die rolstoeldanse; skolastiese vaardigheid is ook ’n self-persepsie wat ’n komponent van die selfkonsep vorm (Shields *et al.*, 2006). Deelnemer 2 se meer positiewe beskouing van haar fisieke voorkoms volgens die na-toetstelling van die Piers-Harris 2 (Fisieke voorkoms-sub-skaal verhoog vanaf gemiddeld tot bo-gemiddeld), dra waarskynlik ook tot groter emosionele onafhanklikheid by.

***TABEL 4*: INTRAPERSOONLIKE ONTWIKKELING VAN DEELNEMERS NA DEELNAME AAN ROLSTOELDANS**

| | Positiewe natoets-resultate met verifiëring deur ’n veelmetode strategie | | |
|---|---|---|---|
| Komponente van ontwikkeling | **Deelnemer 1** | **Deelnemer 2** | **Deelnemer 3** |

| | | | | |
|---|---|---|---|---|
| **Intrapersoonlik** | Selfagting | | | |
| | Emosionele selfbewussyn | | | |
| | Selfhandhawing<br>Selfgeldingsdrang | | | |
| | Onafhanklikheid | | | |
| | Selfverwesenliking<br>Selfaktualisering | | | |

***Selfverwesenliking***

Al drie deelnemers beleef groter selfverwesenliking sedert hulle deelname aan rolstoeldans. Tydens navraag oor persoonlike doelwitte sê Deelnemer 2: "Dis maklik – ek dans by ballroom!" Rolstoeldans help die deelnemers om hulle potensiaal te verwesenlik. Sumerlin en Bundrick (2000) wys op die verband tussen mense wat hulle self verwesenlik en geluk wat meer as blote hedonisme is. Al drie deelnemers se na-toets-collages bevestig dat hulle gelukkiger was sedert hulle deelname aan rolstoeldans. Die rolstoel-dansinstruktrise bring hulle geluk in verband met die vryheid van beweging wat rolstoeldanse bied. Hierdie vryheid van beweging of kinetiese element word ook deur twee na-toets-metafore uitgebeeld: "n skoenlapper wat oral vlieg waar hy wil wees en 'n perd wat spring. Die Geluk-en-tevredenheid sub-skaal van die Piers-Harris 2 na-toets bevestig met tellings wat van gemiddeld tot bo-gemiddeld verhoog, dat Deelnemers 2 en 3 gelukkiger is. Deelnemer 3 se ma is egter van mening dat haar entoesiasme verminder het, want "hulle doen elke keer dieselfde passies". Alhoewel die klasonderwyser ook iets hiervan laat deurskemer, sê Deelnemer 3 dat sy nie kan wag vir die skoolklok om te lui as sy rolstoel-dansklasse het nie.

Die deelnemers se intrapersoonlike ontwikkeling sedert hulle deelname aan rolstoeldans is in Tabel 4 saamgevat.

## GEVOLGTREKKING EN PRAKTIESE TOEPASSING

Die positiewe invloed wat sportdeelname op adolessente se emosionele ontwikkeling het (Haliimah, 2010), is ook van toepassing op die rolstoelgebonde deelnemers. Die bespreking van die sub-komponente van intrapersoonlike vermoëns as deel van emosionele intelligensie, toon dat deelname aan rolstoeldans al drie deelnemers se emosionele intelligensie in "n mindere of meerdere mate verhoog het. Tabel 4 illustreer dat Deelnemer1 positiewe na-toets-resultate in al vyf sub-komponente getoon het, terwyl Deelnemer 2 in vier sub-komponente en Deelnemer 3 in twee sub-komponente positiewe na-toets-resultate opgelewer het. Alhoewel rolstoeldans bygedra het tot die emosionele ontwikkeling van die deelnemers, het hulle nie almal ewe veel emosioneel ontwikkel nie. Twee van die drie deelnemers toon noemenswaardige ontwikkeling ten opsigte van hulle intrapersoonlike vermoëns. Al drie deelnemers toon groter selfverwesenliking.

Ten spyte van Deelnemer 1 se ontwikkeling ten opsigte van al vyf sub-komponente, behaal sy "n laer telling op die Piers-Harris 2 se Vry van angs sub-skaal, in teenstelling met Taliaffero

*et al.* (2008), wat verminderde angs gerapporteer het. Haar laer telling op die Populariteit sub-skaal van die na-toets kan dui op ongelukkigheid ten opsigte van haar sosiale funksionering, ontevredenheid met vriendskappe, gevoelens van sosiale isolasie, skaamheid en swak interpersoonlike vaardighede (Piers & Herzberg, 2002), wat waarskynlik ook bydra tot meer angs. Die sosiale blootstelling van die rolstoeldans-kompetisie kon die meer introverte deelnemer (aldus haar ma en klasonderwyser), dalk angstig gemaak het omdat sy sosiaal nie so vaardig is nie. Op navraag tydens die onderhoud het sy gesê: "By die kompetisie het ek met een maatjie gepraat".

Die bevindings kan nie na die res van die rolstoelgebonde leerder populasie veralgemeen word nie as gevolg van die klein steekproef wat net op die geleefde ervarings van drie

vroulike deelnemers gefokus het en gevolglik op 'n leemte in die studie dui. Dit dui egter daarop dat daar 'n moontlikheid bestaan dat rolstoeldans as bewegingsaktiwiteit tot die emosionele ontwikkeling van rolstoelgebonde leerders kan bydra. Daar is tydens die verloop van die ondersoek voortdurend probeer om die oordraagbaarheid van resultate moontlik te maak deur vooropgestelde idees met nadenke (refleksie) te probeer beperk, deur kwalitatiewe en kwantitatiewe data-insamelingsinstrumente te gebruik, en deur rolstoeldans binne konteks by wyse van langdurige veldwerk te verken. Dit was nogtans 'n uitdaging om data op so 'n manier te versamel, maar dit bly makliker om die fenomeen so in sy ware konteks te leer ken, soos Nel (2004) dit stel. As eerste of voorloperstudie ontbloot hierdie ondersoek die veld vir verdere navorsing. Afgesien van moontlike emosionele ontwikkeling, bied rolstoeldans as sportsoort geleenthede om aan nasionale en internasionale kompetisies soos die Paralimpiese Spele deel te neem.

**SUMMARY**

**Contribution of wheelchair dancing to emotional development of wheelchair bound learners**

Wheelchair bound learners may have low self-worth, feelings of inferiority and other negative emotions. This study investigates how wheelchair dancing can contribute to the emotional development of the wheelchair bound learner. The study does not focus on the physical impairments of wheelchair bound learners, but on development that may take place on levels other than the physical. Emotional and social development is construed as emotional intelligence which consists of intrapersonal intelligence and social intelligence consisting of interpersonal intelligence. The research question addresses whether learners who participate in wheelchair dancing develop their intrapersonal capacities with specific reference to self-esteem, emotional self-awareness, assertiveness, independence and self-actualisation.

The mainly qualitative enquiry applied a mixed method approach to the pre- and post-test of three female participants between the ages of 10 and 14 years. They participated in a minimum of 20 wheelchair dance classes over a period of nine months. They had not been involved in wheelchair dancing prior to the study. The wheelchair dance classes were presented at the school they attended. These dance classes were presented on a weekly basis by an internationally qualified dance teacher. Each class lasted 45 minutes.

The qualitative and quantitative data collection instruments comprised of observation, semi-

structured interviews, collage activities, metaphor interviews and the Piers-Harris Children‟s Self-Concept Scale, Second Edition (Piers-Harris 2). The semi-structured interviews were conducted with the participants, their parents, their class teachers and the wheelchair dance teacher upon completion of the wheelchair dance classes. Collage activities were used as projection medium to gather information about the participants‟ perceptions of their own emotions and the emotions of others. The collages were done prior to the wheelchair dance classes and repeated upon completion of the wheelchair dance classes. Metaphor interviews to determine the participants‟ thoughts, feelings, attitudes and perceptions of their wheelchair dance classes were conducted prior to the wheelchair dance classes and afterwards. The Piers-Harris 2 was administered as pre- and post-test.

The results showed that the self-esteem of two participants improved. The emotional self-awareness of all the participants developed positively and resulted in improved behavioural adjustment. One participant could assert herself and two participants were more emotionally independent. All the participants demonstrated that they actualised themselves to a greater extent since their participation in the wheelchair dance classes.

Although wheelchair dancing contributed to the emotional development of the participants, more development was evident in two of the participants with regard to their intrapersonal capacities. Participant 1 obtained positive results in all the subcomponents of intrapersonal intelligence (self-esteem, emotional self-awareness, assertiveness, independence and self-actualisation); Participant 2 improved her intrapersonal capacity in four of the five subcomponents (self-esteem, emotional self-awareness, independence and self-actualisation); and Participant 3 developed two subcomponents (emotional self-awareness and self-actualisation). These findings cannot be generalised to the population of wheelchair bound learners due to the small sample size of three female participants, however, it suggests the possibility that wheelchair dancing may contribute to the emotional development of wheelchair bound learners.

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# MOTOR PROFICIENCY PROFILE OF GRADE 1 LEARNERS IN THE NORTH WEST PROVINCE OF SOUTH AFRICA: NW-CHILD STUDY

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***ABSTRACT***

*This study aimed to establish a comprehensive profile of the motor proficiency of Grade 1 learners in the North West Province of South Africa, taking into account gender and racial differences and strengths and weaknesses. A stratified randomised sample of 816 Grade 1 learners (419 boys, 397 girls, mean age 6.84 years (±0.39), were assessed with the 'Bruininks-Oseretsky Test of Motor Proficiency-2 Short Form'. The highest percentage of the group was classified in the below average (n=383; 49.63%) and average (n=405; 48.16%), descriptive categories for motor proficiency with poorest mastery indicated in fine motor integration, fine motor precision and strength. Boys performed significantly better than girls ($p<0.05$), while significantly more White learners were classified in the average descriptive category, compared to Black learners. The motor proficiency of more than 50% of school beginners was below average while girls and Black learners experienced motor proficiency problems to a greater extent compared to boys and White learners. These shortcomings place a high percentage of school beginners at risk for developmental problems associated with inadequate motor skills and should consequently be addressed, especially during the preschool years and the initial years of the primary school phase.*

**Key words:** Motor proficiency; School beginner; Gender; Race; Bruininks-Oseretsky Test of Motor Proficiency-2 Short Form.

## INTRODUCTION

Poor motor proficiency during the early childhood years can impede various aspects of a young child's development (Pienaar, 2009; Cairney *et al*., 2010; Pienaar *et al*., 2013). Transition to formal schooling is further considered a demanding, challenging and stressful period for young children (Bart *et al*., 2007). These researchers found that good motor ability serves as a buffer to these challenges, as it is associated with better scholastic adaptation and more prosocial behaviour, while poor motor ability emerges as a vulnerability factor in the transition period to normal schooling. Researchers (Rosenbaum *et al.*, 2001; Avi-Itzhak & Obler, 2008; Westendorp *et al.*, 2011) have indicated that fine motor skills, perceptual-motor abilities and fundamental motor skills play an important role in the learning process and are consequently important skills for the school beginner to master. Pheloung (2003) reported in this regard that movement provides the foundation for the brain to integrate brain function for academic work by means of stimulation. Goddard-Blythe (2000) further indicated that

'Attention' (A), 'Balance' (B) and 'Co-ordination' (C) are the primary 'ABC' upon which all learning builds. Fredericks *et al., (*2006) are furthermore of the opinion that if these skills are

not sufficiently developed in the school beginner, the child is likely to develop specific learning problems.

In addition to these associations, researchers report that adequate motor competency during the early childhood years is also important to ensure lifelong participation in sport and physical activity (Van Beurden *et al.,* 2002). The fundamental motor skills, categorised as stability, locomotor and manipulation skills, which develop during this period, are important building blocks upon which more sport-specific and specialised skills are built (Gabbard, 2008). Furthermore, research findings show a relationship between motor proficiency and participation in physical activity (Wrotniak *et al.,* 2006; Williams *et al.,* 2008; Haga, 2009), which suggest that children with inadequate motor skills avoid participation in sport activities because they struggle to master advanced skills (Van Beurden *et al.,* 2002; Pang & Fong, 2009). Consequently, if children do not become motor proficient during the early childhood years, their participation in physical activity later in life could be hampered.

High percentages of perceptual motor problems are reported for young children. Research by Gligorovic *et al*. (2011) indicate that a significant number of typically developing young school children had perceptual motor difficulties, while Nikolic and Ilic-Stošovic (2009) report high percentages of motor skill disorders in three areas of motor development functioning, namely neuromaturation, coordination and balance in a sample of 6.5 to 11 year old children. There has been a worldwide decline in children's motor skills over the past 15 to 20 years (Kretschmer, 2001). Sanders and Kidman (1998) reveal that learners between the ages of 10 and 11 years have only fully mastered 6 of the 12 fundamental motor skills (bouncing, catching, running, hopping, leap-jumping and sliding) that were assessed.

Van Beurden *et al.* (2002) report that 21.3% of learners in Australia only exhibit near mastery and 25.7% mastery of balancing, throwing, catching, speed, hopping, kicking, sliding and jumping skills. Research in New South Wales show that no more than 35% of the learners demonstrated mastery of throwing, kicking, leaping, hopping, sliding and skipping proficiency (Okely & Booth, 2004), while Butterfield *et al*. (2012) report 80% of mastery of object control skills up to 14 years of age in some of these skills. A few studies that were conducted in South Africa also show that South African children display inadequate motor skills. Du Toit and Pienaar (2001) reveal that 25.27% to 27.47% of 6-year-olds demonstrated below average skills when balancing on one leg, while a study by Africa and Van Deventer (2005) of 7- to 9-year-old girls indicate that girls are weaker in standing long jump, running and jumping over a high object with speed, agility skills, running over and under a series of objects and cable jumping, compared to a study completed in 1976.

However, these South African studies were based on small samples of participants and examined only a few variables that do not reflect a comprehensive profile of the motor proficiency levels of South African children. In order to create a comprehensive profile of the motor proficiency of young children, it is also important to obtain knowledge about possible gender and racial differences that may exist. Gender differences are reported by researchers where boys performed better in object control skills, standing long jump, strength and running skills (Du Toit & Pienaar, 2002; Okely & Booth, 2004; Portela, 2007; Shala, 2009), while girls out performed boys in locomotor skills, balancing and bilateral integration (Van

Beurden *et al.,* 2002; Okely & Booth, 2004; Portela, 2007; Hardy *et al.,* 2010). However, results are also reported indicating no gender differences (Du Toit & Pienaar, 2002; Shala, 2009; Milanese *et al.,* 2010; Venetsanou & Kambas, 2011). Racial differences are further reported in a few studies (Pienaar *et al.,* 2007; Capute *et al*., 1985; Uys & Pienaar, 2010).

South Africa is described as a 'Rainbow Nation' which includes various ethnic groups, languages and cultures, as well as a range of socio-economic circumstances (Edginton *et al.*, 2012), which pose several challenges to child development. South African statistics further show that 72% of children living in the North West Province of South Africa grow up in poverty (Millennium Developmental Goals, 2010). Lejarrage *et al.* (2002) report that the environment in which children grow up plays a significant role in their motor development. As the early childhood years are considered the golden years for motor development, it is vital that children are provided with enough opportunities to practise and improve their motor skills during this developmental period (Hardy *et al*., 2010). Deficits with regard to motor skills in children who grow up in disadvantaged communities have been found (Goodway & Branta, 2003; Robinson & Goodway, 2009), mostly because of a lack of opportunities. A study by Pienaar *et al.* (2007) of 5- to 6-year-old South African children confirm that children from low socio-economic circumstances (SEC), display developmental deficits of up to 12 months in comparison to their chronological aged peers from higher SEC.

These findings raise concerns about the current level of motor proficiency of young school beginners in South African schools. Motor proficiency refers to the specific abilities upon which performance is built and which is measured by means of tests for running speed and agility, balance, bilateral co-ordination, strength, upper limb co-ordination, reaction speed, visual-motor control, upper limb speed and agility (Sherrill, 2004). It is evident from the above discussion that motor proficiency plays an important role in a child's cognitive, social and emotional development, life-long participation in physical activity and total well-being, and that the early childhood years are a vital developmental period in which to optimise the motor development of young children.

Bearing in mind that it is important to have adequately developed motor skills for all spheres of life, it is important to determine the strengths and weaknesses in the motor proficiency make-up of children, in order to timely treat possible difficulties. Few studies report comprehensive profiles of the motor proficiency of school beginners and most of these studies used the 'Test of Gross Motor Development (TGMD)', which only provides a profile of the locomotor and object control skills of children. South African studies that have reported statistics in this regard are not based on randomised sampling or examined only selected variables and consequently have shortcomings. Researchers, practitioners, health authorities and educators, however, need comprehensive information about the levels of motor proficiency of young children in order to develop appropriate intervention strategies and awareness in this regard.

## AIM OF RESEARCH

The aim of this study was to compile a comprehensive profile of the motor proficiency of Grade 1 learners in the North- West Province of South Africa with further investigation into possible gender and racial differences, and the strengths and weaknesses in their motor proficiency profiles.

## METHODOLOGY

### Research group

The research formed part of the NW-CHILD (Child-Health-Integrated-Learning and Development) longitudinal study. Ethical approval was obtained for this study from the Ethics Committee of the North-West University (No. NW 00070 09 A1), as well as from the Department of Basic Education of the North-West Province. Permission was also obtained from each school principal to conduct the testing on a particular day during school hours. Grade 1 learners in the North-West Province of South Africa served as the target population and a total number of 880, Grade 1 learners were identified for the study. The participants were selected by means of a stratified randomised sample in conjunction with the Statistical Consultation Service of the North-West University.

In order to determine the sample, a list of names of all the schools in the North-West Province was obtained from the Department of Basic Education. These schools were grouped into 8 educational districts, each represented by 12 to 22 regions with approximately 20 schools (minimum 12, maximum 47) per region. From the list, regions and schools were chosen randomly with regard to population density and school status (quintile 1 – schools from poor socio-economic areas - to quintile 5 – schools from good socio-economic areas). Boys and girls in Grade 1 were then selected randomly from each of the 20 identified schools in 4 selected school districts. If numbers allowed it, 60 learners were recruited from the schools in order to obtain a minimum of 40 children per school with an even gender distribution. All the learners, whose parents provided consent for their participation in the study, were tested. The total number of Grade 1 learners whose parents provided consent for their participation in the study was 816 (419 boys and 397 girls).

### Measurement instruments

#### *Bruininks-Oseretsky Test of Motor-Proficiency (BOT-2 SF)*

The *Bruininks-Oseretsky Test of Motor-Proficiency second edition (BOT-2) - Short Form* (Bruininks & Bruininks, 2005), consists of 14 items that assess the subject's motor proficiency. This norm-based measuring instrument was validated for use among 4 to 21 year old children (Bruininks & Bruininks, 2005). The BOT-2 SF assess skills in 4 composite motor areas, each containing 2 motor sub-tests, namely: fine manual control (fine motor precision and fine motor integration); manual co-ordination (manual dexterity and upper limb co-ordination); body co-ordination (bilateral co-ordination and balance); and strength and agility (running speed, agility and strength). The knee push-up option was selected in the strength section over the push-up option. Gender specific norms were used for the scoring of the data. Scores are converted to raw scores and point scores for each sub-test (fine motor precision [maximum=14], fine motor integration [maximum=10], manual dexterity [maximum=9], bilateral integration [maximum=7], balance [maximum=8], running speed and agility [maximum=10], upper limb co-ordination [maximum=12] and strength [maximum=18]). These individual point scores were converted to a short form (SF) total point score (maximum=88), a standard score, a percentile ranking and a descriptive category. The descriptive categories reported for the standard scores were: well above average (standard score ≥70); above average (standard score 60-69); average (standard score 41-59);

below average (standard score 31-40); and well below average (standard score <30). The BOT-2 SF has a validity of r=0.80 (Bruininks & Bruininks, 2005).

**Data analyses**

STATISTICA for windows (StatSoft, 2011) was used to analyse the data. Data were analysed for descriptive purposes by using means (M), maximum and minimum values and standard deviations (SD). Data were also analysed by using independent t-testing to determine gender and racial differences and the level of significance was set at $p<0.05$. Because of the small number of Coloured (n=20) and Indian (n=11) children in the sample, these children were not included in the analysis of racial differences (Table 2-4), although their data were taken into account in the analysis of the descriptive statistics (Table 1).

## RESULTS

Table 1 describes the group of Grade 1 learners (N=816) with regard to age, and the number of participants grouped into each race and gender.

***TABLE 1*: NUMBER AND MEAN AGE OF LEARNERS ACCORDING TO GENDER AND RACE**

| Group | | N | Age M | Age SD |
|---|---|---|---|---|
| Gender | Boys | 419 | 6.86 | 0.39 |
| | Girls | 397 | 6.81 | 0.38 |
| Race | White | 218 | 6.86 | 0.34 |
| | Black | 567 | 6.83 | 0.40 |
| | Coloured | 20 | 6.74 | 0.29 |
| | Indian | 11 | 7.07 | 0.27 |
| | Total Group | 816 | 6.84 | 0.39 |

N= Number of participants M = Mean; SD= Standard Deviation

Table 2 displays the percentage of learners in the group and also in each gender and race group who, according to the standard scores (SC) obtained in the BOT-2-SF, were classified into the different motor proficiency descriptive categories. A standard score (SC) of 41.11 classified the group in the average motor proficiency descriptive category which ranges from 41 to 59. On an individual level, most of the 816 learners were classified in the average (n=393; 48.16%) or below average (n=405; 49.63%) descriptive categories. Boys obtained a significantly higher mean standard score of 43.33 compared to girls (27.83; $p<0.05$). A high percentage boys were classified in the average category (n=268; 63.96%) compared to girls, where most of them were classified as below average (n=257; 64.74%). The motor proficiency of White and Black learners (SC=44.40 and SC=39.73 respectively) were significantly different ($p<0.05$), where the motor proficiency of most of the white children was classified as average (n=151; 69.27%), compared to the Black children, of which a high percentage (n=333; 58.73%) was classified as below average.

***TABLE 2*: PERCENTAGE OF LEARNERS CLASSIFIED IN DIFFERENT DESCRIPTIVE CATEGORIES FOR MOTOR PROFICIENCY**

| Group | N | Standard Score | WA average ≥70 SC >98 PR | Above average 60-69 SC 84-97 PR | Average 41-59 SC 18-83 PR | Below average 31-40 SC 3-17 PR | WB average <30 SC <2 PR |
|---|---|---|---|---|---|---|---|
| *Gender* | | | | | | | |
| Boys | 419 | 43.33 | 0 | 3(0.72%) | 268(63.96%) | 148(35.32%) | 0 |
| Girls | 397 | 27.83 | 0 | 2(0.50%) | 125(31.49%) | 257(64.74%) | 13(3.27%) |
| *Race* | | | | | | | |
| White | 218 | 44.40 | 0 | 5(2.29%) | 151(69.27%) | 62(28.44%) | 0 |
| Black | 567 | 39.73 | 0 | 0 | 221(38.98%) | 333(58.73%) | 13(2.29%) |
| **Tot. Gr.** | **816** | **41.11** | **0** | **5(0.61%)** | **393(48.16%)** | **405(49.63%)** | **13(1.59%)** |

SC= Standard Score PR= Percentile Ranking WA= Well Above WB= Well Below

***TABLE 3*: DIFFERENCES IN MOTOR PROFICIENCY BY GENDER AND RACE**

| Variables | Boys (n=419) M | Boys (n=419) SD | Girls (n=397) M | Girls (n=397) SD | White (n=218) M | White (n=218) SD | Black (n=567) M | Black (n=567) SD |
|---|---|---|---|---|---|---|---|---|
| ***Motor control*** | | | | | | | | |
| Fine motor precision PS (14) | 7.26 | 3.12 | 7.07 | 3.91 | **8.97*** | 3.23 | 6.40 | 3.35 |
| Fine motor integration PS (10) | 1.96 | 1.85 | 2.09 | 1.93 | **3.00*** | 2.16 | 1.63 | 1.65 |
| ***Manual co-ordination*** | | | | | | | | |
| Manual dexterity PS (9) | 4.78 | 1.06 | **5.04*** | 1.03 | **5.26*** | 1.12 | 4.77 | 1.00 |
| Bilateral co-ordination PS **(7)** | 4.87 | 2.04 | **5.20*** | 1.92 | **5.82*** | 1.53 | 4.69 | 2.08 |
| ***Body co-ordination*** | | | | | | | | |
| Balance PS (8) | 6.70 | 1.49 | 6.89 | 1.37 | 6.39 | 1.55 | **7.00*** | 1.34 |
| Upper limb co-ordin. PS (12) | **8.16*** | 2.43 | 7.59 | 2.67 | **8.16*** | 2.33 | 7.75 | 2.67 |
| ***Strength and agility*** | | | | | | | | |
| Strength PS (18) | **4.84*** | 2.14 | 4.35 | 2.22 | **5.15*** | 2.01 | 4.40 | 2.18 |
| Run. speed & agility PS (10) | 8.07 | 1.24 | 8.13 | 0.90 | 8.07 | 1.35 | **8.11*** | 0.99 |
| | | | | | | | | |
| **BOT-2 SF Total Point Score** | 47.10 | 7.91 | 47.23 | 8.64 | **51.41*** | 7.42 | 45.40 | 8.05 |
| **BOT-2 SF Standard Score** | **43.33*** | 5.72 | 27.83 | 6.37 | **44.44*** | 6.67 | 39.73 | 5.91 |
| **BOT-2 SF Percentile rank** | **38.77*** | 18.42 | 17.29 | 16.82 | **31.68*** | 21.28 | 19.02 | 15.92 |

M= Mean SD= Standard Deviation PS= Point Score ( ) =Max. PS in brackets *p<0.05= Sign. difference

Table 3 reports the point score means obtained for each of the sub-tests, the BOT-2 SF composite total, BOT-2 SF standard scores and percentile rankings for boys and girls, and for the White and Black learners separately. Significance of differences between boys and girls and white and Black children determined by independent t-testing ($p<0.05$), are also reported in the table. Boys obtained a significantly higher standard score and percentile ranking than the girls ($p<0.05$), although the point score means of the different sub-tests indicated that only a few sub-tests differed significantly. Boys out performed girls significantly in upper limb co-ordination (M=8.16 and M=7.59) and strength (M=4.84 and M=4.35), while girls performed

significantly better than the boys in manual dexterity (M=5.04 and M=4.78) and bilateral co-

ordination (M=5.20 and M=4.87).

The mean standard scores and percentile rankings of the Black and White learners also differed significantly ($p<0.05$). The White children performed significantly better in 6 of the 8 motor proficiency sub-components, while the Black children performed significantly better in balance and running speed and agility skills. The results were also analysed to determine strengths and weaknesses in the motor proficiency profiles of the learners in the different motor proficiency mastery categories.

***TABLE 4*: MEANS AND PERCENTAGE MASTERY OF EACH SUB-TEST IN DIFFERENT DESCRIPTIVECATEGORIES**

| Sub-tests | Well-below average (n=13) M | % | SD | Below average (n=405) M | % | SD |
|---|---|---|---|---|---|---|
| Fine motor precision PS (14) | 3.31 | **23.64** | 2.63 | 5.96 | **42.57** | 3.11 |
| Fine motor integration PS (10) | 0.38 | **3.80** | 0.51 | 1.67 | **16.70** | 1.36 |
| Manual dexterity PS (9) | 3.54 | 39.33 | 0.88 | 4.65 | 51.67 | 0.94 |
| Bilateral co-ordination PS (7) | 2.23 | 31.86 | 1.96 | 4.33 | 61.86 | 2.08 |
| Balance PS (8) | 5.92 | 74.00 | 1.93 | 6.55 | 81.88 | 1.53 |
| Running speed & agility PS (10) | 7.46 | 74.60 | 1.27 | 7.99 | 79.90 | 1.14 |
| Upper-limb co-ordination PS (12) | 3.46 | 28.83 | 1.81 | 6.95 | 57.92 | 2.52 |
| Strength PS (18) | 1.69 | **9.39** | 1.93 | 3.99 | **22.17** | 2.15 |
| | | | | | | |
| **Sub-tests** | **Average (n=393) M** | **%** | **SD** | **Above average (n=5) M** | **%** | **SD** |
| Fine motor precision PS (14) | 8.54 | **61.00** | 3.38 | 7.80 | 55.71 | 6.06 |
| Fine motor integration PS (10) | 2.72 | **27.20** | 2.09 | 5.00 | 50.00 | 1.22 |
| Manual dexterity PS (9) | 5.18 | 57.56 | 1.05 | 7.20 | 80.00 | 0.84 |
| Bilateral co-ordination PS (7) | 5.82 | 83.14 | 1.48 | 7.00 | 100 | 0 |
| Balance PS (8) | 7.05 | 88.13 | 1.25 | 8.00 | 100 | 0 |
| Running speed & agility PS (10) | 8.23 | 82.30 | 1.01 | 9.00 | 90.00 | 0 |
| Upper-limb co-ordination PS (12) | 8.96 | 74.67 | 2.05 | 10.60 | 88.33 | 0.89 |
| Strength PS (18) | 5.30 | **29.44** | 1.96 | 7.80 | 43.33 | 0.84 |

M= Mean SD= Standard Deviation PS= Point Score ( ) = Maximum Point Scores in brackets

Table 4 indicates the mean point score values of the group in each of the 8 sub-tests of the BOT-2 SF and in each of the different descriptive categories of motor proficiency (well below average, below average, average, above average). Percentage mastery was calculated for each of these point scores from which strengths and weakness could be inferred. The percentages show that the learners, irrespective of the descriptive group that they were categorised in, performed the poorest in strength, fine motor precision and fine motor integration skills.

## DISCUSSION

This was a first study to compile a comprehensive profile of the motor proficiency of Grade 1 learners in the North-West Province of South Africa, which includes knowledge about possible gender and racial differences, as well as strengths and weaknesses in the motor proficiency make-up of the group.

The results indicated that the motor proficiency of Grade 1 learners were average although on an individual level, a high percentage of them exhibited below average (49.63%) to average (48.16%) levels of motor proficiency. These statistics raise concern since it indicates that one out of every two learners was classified into a category of motor proficiency that indicates below average motor proficiency (percentile ranking between 3 and 17, and less than -2.0 and -1.0 standard deviations below the mean). The results, however, coincide with research findings world-wide, which report decreasing trends in motor development (Kretchmer, 2001), high percentages of perceptual motor problems (Gligorovic *et al*., 2011; Pienaar *et al*., 2013), and below average to average mastery of fundamental motor skills in this age group (Van Beurden *et al.*, 2002; Okely & Booth, 2004; Hardy *et al*., 2010). Various reasons can be suggested for these disturbing results. It is reported that contemporary children are less inclined to participate in physical activity and sports activities and spend more time indoors (Williams *et al.*, 2008; Haga, 2009). Modern day technology, which includes computers and television, public transport, unsafe environments, increased crime and urbanisation, also further contribute to inactive lifestyles (Somers *et al.*, 2006; Hills *et al.*, 2007), which again limits a child's opportunities to develop motor skills and cause children to suffer from movement deficiency (Kretschmer, 2001). The rising obesity epidemic, which is associated with the lack of physical activity and poor motor skill development (Truter *et al*., 2012; Kemp & Pienaar, 2013), is considered another probable contributing factor to this deficiency.

The reduced time that is allocated to physical education and movement programmes in schools, the lack of experts delivering these programmes in schools and learning content without clear outcomes in this area could also be contributing factors (Van Deventer, 2004; Rajput & Van Deventer, 2010; Edgington *et al*., 2012). The winning-at-all-cost phenomenon in school sport also hampers motor development goals during the important developing periods. Other factors such as socio-economic circumstances, gender and racial preferences can also play a role, as was evident from our results and which is also confirmed by researchers studying the physical activity levels and patterns of South African children (McVeigh *et al*., 2004; Walter, 2011). However, variability in motor development or developmental delay, which is characteristic of children at this young age, could also be a possible contributing factor, although it will only be possible to determine such an effect by means of longitudinal research. More research focussing on the possible reasons brought to the fore in this discussion is consequently necessary for a better understanding of the possible contributing factors.

The sub-tests of the BOT-2 SF showed that the greatest deficiencies were strength, fine motor integration and precision skills, irrespective of the motor proficiency category in which the subjects were categorised (Table 4). Steps should thus be taken to address the poor overall motor proficiency and especially the weaknesses that were identified in the motor proficiency make-up of Grade 1 learners. Adequate fine motor skills (which include fine motor integration and precision), are important for academic performance as school beginners spend more than half of their school day using fine motor activities (Tseng & Chow, 2000).

Sufficient core strength and shoulder stability are furthermore key to the development of adequate fine motor skills (Gabbard, 2008), while bodily strength is an important health enhancing physical fitness component which is needed for sport participation.

The analysis of gender differences (Table 3) indicate significant differences, showing that the overall motor proficiency of boys were superior to that of the girls, and that they outperformed girls significantly in the upper limb co-ordination and strength skills sub-items. The better upper limb co-ordination of the boys could probably be ascribed to better object control skills in boys, which are reported in several studies concerning 1 to 9 year old boys (Van Beurden *et al.*, 2002; Okely & Booth, 2004; Hardy *et al.,* 2010), as the test required them to drop and catch a ball and dribble it with alternating hands. The better strength of the boys further coincides with various studies that report similar findings (Hands & Larkin, 1997; Du Toit & Pienaar, 2002; Malina, 2004; Okely & Booth 2004; Portela, 2007; Shala, 2009). Researchers furthermore reported that boys engage more in high intensity physical activity than girls (Walter, 2011), that they play outdoors more and are encouraged by parents and peers to participate in different and more extreme types of activities than girls, such as jumping and running, which could also contribute to improved strength. Girls on the other hand, generally play more indoors and are more encouraged to play gently, performing fine motor activities (Portela, 2007; Walter, 2011; Bouchard *et al.,* 2012).

Girls were on average categorised in the below average descriptive category for motor proficiency, which places a high percentage of them at a young age at risk for developmental problems associated with inadequate motor skills. However, they outperformed boys significantly in bilateral co-ordination and manual dexterity, which is supported by other research findings. Portela (2007) reports bilateral integration differences in South African learners in the Foundation Phase (Grade R to 3) and ascribed the differences to the type of activities in which girls participate such as dancing. The better manual dexterity of the girls further coincides with a study by Sigmundsson and Rostoft (2003) on 4 year old pre-schoolers, which also reported better manual dexterity in girls.

Fine motor integration, fine motor precision, balance, running speed and agility showed no differences between the genders which is contradictory to studies indicating gender differences. However, Bruininks and Bruininks (2005) report that fine motor skill differences between boys and girls decrease as they get older which substantiate our findings in this regard. Better balancing scores are reported for girls by Du Toit and Pienaar (2002), Portela (2007), Shala (2009) and Venetsanou and Kambas (2011). No gender differences were also found in running speed and agility, although the girls achieved slightly higher mean values than the boys in the current study. Milanese *et al.* (2010) report better running speed and agility in 6 to 7 year old boys based on the performance of the 30m agility test, while in the current study it was required of the subjects to hop as fast as possible on one leg for 15 seconds. As girls in our study also obtained slightly better balancing skills scores than the boys it could probably be contributed to their ability to hop faster on one leg ($p>0.05$). Girls

also play games such as 'hopscotch', which could also improve their ability to hop on one leg. Attention should consequently be paid to the improvement of the overall motor proficiency of girls, but also specifically in sub-tests that influenced the overall motor proficiency of girls and boys.

Significant motor proficiency differences were also found between White and Black learners.

A higher percentage of White learners (69.27%) compared to 38.98% of the Black learners showed average motor proficiency, while a high percentage of Black learners were categorised in the below average (58.73%) motor proficiency category. White learners performed significantly better in 6 of the 8 sub-components of motor proficiency, excluding balance and running speed and agility in which the Black children outperformed them significantly. However, most of the Black learners came from low socio-economic areas (quintile 1, 2 and 3 schools, mainly due to the historical past of South Africa), and these differences between the race groups were consequently ascribed more to environmental influences than to racial differences as several studies report associations between motor skills and socio-economic circumstances (Goodway & Branta, 2003; Pienaar *et al.*, 2007; Robinson & Goodway, 2009; Uys & Pienaar, 2010; Walter, 2011). The White learners performed significantly better in fine motor precision and fine motor integration skills, which coincide with the findings of Uys and Pienaar (2010), who also reported poorer fine motor skills in children living in lower socio-economic areas.

Children living in low socio-economic areas might also possibly receive less stimulation at home with regard to fine motor skills and the day care centres and nursery schools that they attend might be under-resourced to improve fine motor skills. White learners also performed significantly better in manual dexterity and bilateral co-ordination. Portela (2007) reports no significant differences between Foundation Phase learners from independent schools and schools from low socio-economic areas in manual dexterity, although the learners in low socio-economic areas performed slightly better in bilateral co-ordination. White learners also showed better upper limb co-ordination which could possibly be ascribed to them participating in activities that can improve upper limb co-ordination such as netball, cricket and rugby. Mcveigh *et al*. (2004) also report higher physical activity levels and differences in the physical activity patterns of 9 year old White and Black South African children. Black children played traditional games, such as tag games and soccer (Walter, 2011), which might possibly contribute to improved lower limb co-ordination. However, the better upper limb co-ordination of White children contradicts the findings of Portela (2007), which indicates better upper limb co-ordination in children from low socio-economic areas. The strength of Black learners in the study could possibly be influenced negatively by malnutrition and protein deficiencies in their diets which are indicated to have an effect on the physical growth and energy levels of children from impoverished backgrounds (Henneberg *et al.*, 1998; Portela, 2007).

Attention should consequently be given to the identified weaknesses in the motor proficiency make-up of learners from different racial groups and especially those that were identified among learners growing up in disadvantaged communities (who, in the case of this study, were mainly Black learners). These include fine motor precision, fine motor integration, manual dexterity, bilateral co-ordination and upper limb co-ordination and motor proficiency in general. The better motor proficiency of the White learners, who were mainly in quintile 4

and 5 schools, could also be ascribed to them being exposed in these schools to a greater extent, to physical education and participation in sport activities during and after school.

Most of the White learners in the study also live in higher socio-economic areas where they are exposed to quality preschool programmes before entering the formal schools and that are in most cases also well-resourced with aids for the development of motor proficiency. Affluent parents can also afford to expose their children to additional stimulation

programmes that can improve their motor development. Walter (2011) report that the afternoon activities of girls living in lower socio-economic areas are curtailed from a young age by compulsory domestic responsibilities and that their preferred games are sedentary, which is a concern that needs to addressed, as motor proficiency depends to a great deal on sufficient opportunities to develop these skills. These activity patterns which are embedded in cultural beliefs, place a much higher responsibility on schools to ensure that young girls whose motor development are restrained by these beliefs obtain enough opportunities to improve their motor skills during school hours.

The Black learners however, performed significantly better in balancing skills compared to White learners, which agree with other studies that reported similar results (Portela, 2007; Uys & Pienaar, 2010). The Black learners also performed significantly better in running speed and agility, which could possibly be ascribed to the fact that most of them live in low socio-economic areas where they are to a large extent, not exposed to technology and, consequently, play outdoors more (Walter, 2011). The sub-items that were used to determine the running speed and agility consist of, for example, hopping, one-leg side-jumps and two-leg side-jumps that are regularly part of traditional games that are played by children in low socio-economic areas.

This study had limitations which need to be recognised. For practical reasons such as time constraints, the BOT-2 SF had to be used rather than the complete version of the BOT-2, which limits the applicability of the use of the results in different settings, such as, for example, clinical assessment purposes. Although everything was done to optimise the testing conditions, assessments had to be performed during school hours where distractions from other children could have influenced the results. However, the strength of the study is the large randomised and representative sample that increased the generalizability of the results. The results will also serve as the baseline measurements of the on-going NW-child longitudinal study which investigate various factors influencing child development. A follow-up objective of this study is to track the motor proficiency of the subjects over time, and then to establish from a developmental systems approach, whether the motor proficiency of the group during baseline was the result of developmental delays or of poor motor functioning.

## CONCLUSIONS

This study showed that the motor proficiency of more than 50% of Grade 1 learners in the North-West Province of South Africa put these learners at risk of developing various problems that are associated with inadequate motor proficiency. Strength, fine motor integration and fine motor precision showed the greatest deficits in the motor proficiency makeup of the group, thus attention should especially be devoted to the improvement of these

skills. The overall motor proficiency of boys was significantly better than that of girls and a very high percentage of girls exhibited below average motor proficiency. Consequently, special attention should be paid to the motor proficiency of girls in general, with specific attention to their upper limb co-ordination and strength, while the development of the manual dexterity and bilateral co-ordination of boys should also receive special attention. A large group of the Black learners (58.73%) furthermore exhibited below average motor proficiency and attention should consequently be devoted to the improvement of their motor proficiency, especially with regard to fine motor precision, fine motor integration, manual dexterity,

bilateral co-ordination, upper limb co-ordination and strength. More research is recommended regarding problems associated with poor SES, cultural beliefs and responsibilities in order to provide a better understanding of these influences on development, but also of racial differences as these differences were clouded by environmental influences in this study.

Inadequate motor proficiency can impact negatively on the health, academic progress and sport participation of young children and, therefore, require accountability from different stakeholders and on various levels in order to address the problem significantly. On a government level, the Department of Basic Education should place more emphasis on the importance of motor development of young children as a key learning area, especially in the earlier grades, because of the important role that motor development plays in a young child's overall development. They could use the statistics of this study to create more awareness among educators of the current disturbing situation and to develop strategies to address the problem, especially among educators who teach in lower SES areas where the problem is even bigger. Educators should also be empowered more by receiving in service training to optimally develop motor skills in learners, while under-resourced schools should be better equipped with age appropriate aids and equipment to improve motor development. As the preschool years is a vital motor skill developmental period, health care workers should also be endowed with knowledge that they can disseminate in communities among mothers of young children and to caregivers not only to create more awareness about the importance of providing young children with opportunities to develop motorically, but also about the health risks involved in inadequate motor development, such as obesity and diabetes.

Improvement of children's motor development is a modifiable risk factor which can be addressed significantly if professionals in this field are involved in the delivery of this content area. Thus, on a school governance level, headmasters should ensure that experts, such as trained Life Orientation or Physical Education teachers or Kinderkineticists be appointed within schools, not only to develop the basic motor proficiency of young children, but also to provide remedial help where deficiencies are identified. It is, however, also important that these appointed experts should be held accountable for outcomes that have to be obtained regarding the development of age appropriate motor proficiency skills of children. The outcomes of any sport and motor development programmes that are presented to young children, especially as part of the school curriculum, should also be revisited and adjusted to make sure that these programmes will improve the motor proficiency foundation of all children, whatever their abilities, gender, race or culture, in order to ensure that physical activity becomes meaningful for all.

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# COMPARING EFFECTS OF WINTER UNIVERSIADE (2011) AND EUROPEAN YOUTH OLYMPIC FESTIVAL (2011) MEGA SPORT EVENTS

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***ABSTRACT***

*The objective of this study was to compare the views of the local spectators concerning the effects of the Winter Universiade and the European Youth Olympic Festival, two mega sport events held in Turkey in 2011. The participating group was composed of 878 local spectators who watched the games. The Mega Event Impact Scale, developed by Jie and Yan (2010), was used as the data collection tool. Dimensions forming the scale were compared according to the demographic characteristics of the sample group in order to define the views of the local spectators on the effects of mega events. The results revealed significant differences*

*in the sample group in relation to the demographical characteristics of gender, education, occupation and income status regarding the effects of the Winter Universiade and the European Youth Olympic Festival events. The monthly income of the local spectators who attended the events did not influence the effects perceived. Sample group views on both positive and negative effects of these two events have high averages. In other words, positive and negative effects were detected in both the Winter Universiade held in Erzurum and the European Youth Olympic Festival held in Trabzon.*

**Key words**: Mega sport events; Local spectator impressions; Winter Universiade; European Youth Olympic Festival.

## INTRODUCTION

One of the most important activities in the expanding sport industry is undoubtedly mega events. Such events are one of the most exciting and fastest growing examples of economic and tourism activities in several countries and destinations. Mega sport events are associated with notable economic and social benefits, as well as the broad media coverage that covers the city in which those events are held. Mega events are once-off events, and they reveal both favourable and unfavourable long-term effects on the host country (Ritchie & Aitken, 1984; Crompton & McKay, 1994; Mihalik & Cumming, 1995; Gamage & Higgs, 1997; Delpy & Li, 1998; Mihalik & Simonette, 1998; Crompton *et al*., 2001; Simsek, 2012). Mega sport events are used to introduce the opportunities for promoting countries, creating new lines of business, ensuring economic contributions, providing tourism mobility, carrying society to a healthier future with sport, providing more modern sports arenas, educating a more successful youth and creating a healthier community. As a result, all types of mega sport events to be held are of vital importance in terms of the development and success of the sport industry of the countries (Simsek, 2011).

## LITERATURE

Mega sport events are accepted as economic and developmental catalysers, as they create a new image for the host country or strengthen the current image by attracting spectators, reconstructing the degenerated facilities and attract the attention of media (Hall, 1992; Getz, 1997; Fredline & Faulkner 2000; Austrian & Rosentraub, 2002; Gibson *et al*., 2003; Santo, 2005; Cornelissen & Swart, 2006). Tourism, which plays a key role among the acquisitions obtained by hosting large sport events, can make great contributions to the country, region and city by ensuring the accommodation, food and beverage, souvenir, ticket, and tour expenses for visitors of the event. Mega sport events have been reported to have an enormous power likely to stimulate the potential of tourism mobility, media participation and international recognition (Burgan & Mules, 1992; Jeong, 1998; Crompton, 2000). One potential is the reinforcement of travel and the city image of the whole country (Gelan, 2003; Kim *et al*., 2006). Travelling and city image, supported by mega sport events, are considered to be of vital importance both in attracting visitors, as well as raising the ratio of re-visiting such cities (Searle, 2002). Furthermore, media coverage, being closely associated with the event, enhances the media awareness and promotion of the host city as a tourism destination (Ritchie & Smith, 1991; Jago, 2003; Brown *et al*., 2004).

In the strategic plans, the attraction of the host country as a tourism destination must be strengthened both before and after the event in order to optimise the economic benefits during

the event (Bramwell, 1997; Chalip, 2001, 2004). Additionally, the studies analysing the socio-cultural, socio-demographic and cultural effects of mega sport events report not only positive, but also negative effects. It is stated that the negative risks are likely to arise due to the mega sport events, but can be avoided by acting in accordance with the local enterprises and the values of the host society and by taking responsibility (Hall, 1989; Brunt & Courtney, 1999; Williams & Lawson, 2001). Benefits acquired through cultural exchanges are limited, as the visitors stay for a short period of time and communication with the local community is very limited. However, by creating discussion opportunities and making the required statements, the local community would be able to experience the benefits of the event (Besculides *et al*., 2002).

Setting up the sub-structure of mega sport events and the effects of such events on the facilities and the environment are generally accepted to be the most important benefits that can lead to having permanent effects. The environmental effects on the transportation sub-structure, the stadium, new sport halls and buildings, development of landscape and housing are examples (Ritchie & Lyons, 1987; Witt, 1988). Several scales were developed within the field of sport science to determine the effect of mega sport events, which is considered one of the most important events within the sport industry. Ritchie (1984) developed a classification for the effects required to be assessed before a mega sport event. Within this classification, the six effects include the economy, tourism/trade, physical, socio-culture, psychology and politics, most of which are related to tourism, are defined. Jeong (1998) introduced seven dimensions of visitor perceptions in terms of the effects of EXPO. These dimensions relate to the following effects: positive urban development, positive tourism development, negative socio-economic consequences, and advantageous public relations at a macro level, positive recreational and negative economic-environmental outcomes.

Fredline and Faulkner (2000) investigated the reactions of the host community of the Gold Coast Indy event in Australia and summarised 36 effect statements that benefit society, short-term negative effects, international profile and economic benefits, negative economic impact, disadvantageous physical effects, as well as the effect of facility development. Kim and Petrick (2005) developed five dimensions out of 22 positive effect statements, which are the development of tourism resources and strengthening city life, improving and strengthening city image, economic benefits, attraction of foreign countries or cultures, as well as the development of the tourism sub-structure. Furthermore, three dimensions out of nine negative effects, namely confusion and conflict, negative economic outcomes, together with traffic problems and congestion were defined. Kim *et al*. (2006) defined seven dimensions, which are the benefits of cultural exchange, economic benefits, natural resources and cultural development, social problems, traffic congestion and population, price increases and construction expenses.

The Mega Event Impact Scale developed by Jie and Yan (2010) is the most recent study within the literature of sports events, which was applied to determine the effect of mega sport events. To develop this scale the current study was based on the studies of Kim and Petrick (2005) and Kim *et al*. (2006). The eight-dimension scale is composed of 42 questions together with five positive dimensions, namely the development of tourism sub-structure, improving and strengthening the city image, economic benefits, cultural exchange and environmental and cultural protection. The three negative dimensions include economic expenses, social and environmental problems, as well as cultural problems and conflict. Furthermore, Jie and Yan (2010) state that measuring the perception of the local community

can be used to estimate and manage the reactions of the "local community" in the large events to be held in future.

## METHODOLOGY

### Research Model

The general screening model, one of the descriptive research methods was used in this study. The screening model is defined as the research approach intended to define a current situation as it is (Ozmen, 2000; Karasar, 2005).

### Population and sampling

The population of the research was composed of the spectators of mega sport events, namely the *Winter Universiade* and the *European Youth Olympic Festival*, each held in Turkey during 2011. Certain samples were required to be defined within the population since the scope of the population is considerably broad and certain problems with expenses, time, and control were experienced within the population. Eight hundred and seventy-eight (N=878) local spectators of the mega sport events were selected from this population using the convenient sampling method.

### Data collection tool

Related literature was reviewed in order to determine the study model. Upon providing the theoretical basis, the data were collected by means of a questionnaire as the main technique. Techniques, such as interviews, analyses and document reviews were used as auxiliary techniques. The *Mega Event Impact Scale*, developed by Jie and Yan (2010), was used to collect data on the views of the Turkish society regarding the effects of mega sport events, and to determine what positive and negative effects such events offer for the host country or city. The *Mega Event Impact Scale* is an 8-dimension scale composed of 42 questions together with 5 positive dimensions, namely improving and strengthening the city image, development of the tourism sub-structure, economic benefits, cultural exchange, and environmental and cultural protection. The 3 negative dimensions included were economic expenses, social and environmental problems, as well as cultural problems and conflict.

Face validity and scope validity of the scale was ensured upon evaluating the views and recommendations of the experts. A descriptive factor analysis was applied to determine the structure validity of the scale that revealed an 8-factor structure with 38 items. Furthermore, validity of the structure obtained through descriptive factor analysis was cross checked with the confirmatory factor analysis. Based on the results of the confirmatory factor analysis, the following conclusions were drawn: $\chi 2=375.45$, df=149, $p=0.000<0.001$; $\chi 2/df=2.6$; RMSEA=0.055 (acceptable); NFI=0.93 (acceptable); NNFI=0.96(acceptable); CFI=0.98 (harmony); GFI=0.94; (acceptable) and AGFI=0.89 (acceptable). The lowest correlation value of the test-re-test reliability of the scale was found to be 0.58, while the highest correlation value is 0.88. Additionally, internal consistency reliability calculated for the whole scale was 0.917. According to the findings, the item-total correlation coefficient of the internal consistency reliability of the factor items was 0.50–0.85. With the data analyses, the *Mega Event Impact Scale* was observed to ensure validity and reliability within the Turkish language and culture.

**Analysis of data**

Frequency distributions, arithmetic means and standard deviations of the data obtained were submitted as descriptive statistics. Furthermore, a t-test and one-way analysis of variance (ANOVA) were used to determine the gender, educational level, occupation, and income status differences within the sample group to reveal the effect of the mega events. One of the prerequisites for the analyses of variance was to select each group with randomly chosen subjects from the main population that would display a normal distribution. In this regard, the results obtained were between a kurtosis of -0.247 and -1.859 and a skewness of -1.212 and -0.401 that represent a normal distribution. Variance homogeneity assessment for the averages differing in t-test and ANOVA was carried out with Levene's test, and all the data were detected to be homogeneous. Measurement values ensuring variance homogeneity were analysed with Tukey statistics in order to determine the sources of difference according to gender, educational level, occupation and status of household income ($p<0.05$).

## FINDINGS

For the assessment of the effect of mega sport events, the *Winter Universiade* and the *European Youth Olympic Festival*, held in Turkey in 2011, a t-test and ANOVA analyses were applied in order to determine the differences in the views of local spectators. As a result of the analyses carried out, the spectators evaluated the effects of mega sport events differently according to gender, educational levels, occupations, and levels of household income. A comparison was made for each mega event, taking into account the group with the highest mean value for gender, educational level, occupation and level of household income.

**Gender**

Table 1 provides statistics reflecting the differentiation of the dimensions of the *Mega Event Impact Scale* according to the gender of the sample group.

***TABLE 1*: DIFFERENTIATION DIMENSIONS OF MEGA EVENT IMPACT SCALE ACCORDING TO GENDER**

| Dimensions | Events | Gender | n | M | SD | t-value | p-value |
|---|---|---|---|---|---|---|---|
| City image enhancement & consolidation | W. Univ. | Female | 186 | 4.34 | 0.4986 | 0.121 | 0.937 |
| | EYOF | Female | 196 | 4.30 | 0.5356 | 1.783 | 0.041* |
| Tourism infrastructure development | W. Univ. | Male | 226 | 4.28 | 0.4820 | 0.778 | 0.437 |
| | EYOF | Male | 265 | 4.36 | 0.5841 | 0.458 | 0.720 |
| Economic benefits | W. Univ. | Male | 226 | 4.15 | 0.5601 | 1.378 | 0.045* |
| | EYOF | Female | 196 | 4.12 | 0.5990 | 0.581 | 0.562 |
| Cultural exchange | W. Univ. | Female | 186 | 4.25 | 0.5736 | 0.423 | 0.701 |
| | EYOF | Male | 265 | 4.20 | 0.6423 | 0.275 | 0.783 |
| Environment & culture preservation | W. Univ. | Female | 186 | 4.42 | 0.5912 | 1.224 | 0.032* |
| | EYOF | Female | 196 | 4.36 | 0.5527 | 0.263 | 0.793 |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Economic costs | W. Univ. | Male | 226 | 4.56 | 0.5366 | 0.051 | 0.959 |
| | EYOF | Female | 196 | 3.83 | 0.6576 | 2.045 | 0.041* |
| Social & environmental problems | W. Univ. | Female | 186 | 3.42 | 0.8529 | 2.179 | 0.029* |
| | EYOF | Female | 196 | 4.34 | 0.4772 | 1.487 | 0.138 |
| Culture conflicts | W. Univ. | Female | 186 | 4.45 | 0.5442 | 0.167 | 0.867 |
| | EYOF | Male | 265 | 3.86 | 0.8195 | 0.557 | 0.577 |

W. Univ.= Winter Universiade EYOF= European Youth Olympic Festival M= Mean SD= Standard Deviation
* p<0.05 ** p<0.01

A t-test was applied to determine whether the effects of *Winter Universiade* and *European Youth Olympic Festival* sport events reveal statistically significant differences based on gender in the sample group. According to the results, the effects of both mega sport events revealed significant differences between the genders. More men were positive about the "economic benefits" dimension (Mean=4.15), one of the positive effects of the *Winter Universiade* mega sport event, while more women reported positive views in the "environmental and cultural protection" dimension (Mean=4.42). In the "social and environmental problems" dimension, one of the negative effects of the *Winter Universiade* mega sport event, women had a higher mean than the men (Mean=3.32)

Women's views on the "improving the city image" dimension, one of the positive effects of the *European Youth Olympic Festival*, were more positive than that of the men (Mean=4.30). In the "economic expenses" dimension, one of the negative effects of the *European Youth Olympic Festival*, the women scored a higher mean than the men (Mean=3.83). No significant difference was found between men and women in the dimensions "development of the tourism substructure", "cultural exchange" and "cultural problems and conflict".

**Education levels**

***TABLE 2*: DIFFERENTIATION DIMENSIONS OF MEGA EVENT IMPACT SCALE ACCORDING TO EDUCATION LEVELS**

| **Dimensions** | **Events** | **Education** | **n** | **M** | **SD** | **t-value** | **p-value** |
|---|---|---|---|---|---|---|---|
| City image enhancement & consolidation | W. Univ. | Graduates | 14 | 4.39 | 0.4365 | 4.235 | 0.001** |
| | EYOF | Assoc. degree | 208 | 4.33 | 0.4986 | 2.615 | 0.009* |
| Tourism infrastructure development | W. Univ. | Graduates | 14 | 4.58 | 0.5345 | 5.612 | 0.001** |
| | EYOF | Assoc. degree | 208 | 4.65 | 0.4632 | 4.397 | 0.010* |
| Economic benefits | W. Univ. | Graduates | 14 | 4.42 | 0.4451 | 5.829 | 0.001** |
| | EYOF | Graduates | 23 | 4.28 | 0.5119 | 2.321 | 0.031* |
| Cultural exchange | W. Univ. | Assoc. degree | 204 | 4.50 | 0.5879 | 2.366 | 0.029* |
| | EYOF | Graduates | 23 | 4.43 | 0.4997 | 4.632 | 0.001** |
| Environment & culture | W. Univ. | Graduates | 14 | 4.36 | 0.5325 | 5.605 | 0.001** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| preservation | EYOF | Graduates | 23 | 4.30 | 0.5264 | 2.112 | 0.016* |
| Economic costs | W. Univ. | Graduates | 14 | 3.97 | 0.5758 | 2.233 | 0.001** |
| | EYOF | Elem. School | 55 | 3.88 | 0.5884 | 1.978 | 0.024* |
| Social & environmental problems | W. Univ. | Elem. School | 57 | 3.74 | 0.7835 | 4.565 | 0.001** |
| | EYOF | Graduates | 23 | 4.37 | 0.5254 | 3.456 | 0.001** |
| Culture conflicts | W. Univ. | Assoc. degree | 204 | 4.51 | 0.5654 | 2.425 | 0.001** |
| | EYOF | Assoc. degree | 208 | 3.95 | 0.8213 | 2.238 | 0.001** |

W. Univ.= Winter Universiade EYOF= European Youth Olympic Festival M= Mean SD= Standard Deviation
* p<0.05 ** p<0.01

An ANOVA analysis was applied in order to determine whether the effects of the *Winter Universiade* and the *European Youth Olympic Festival* mega sport events revealed statistically significant differences based on the educational levels in the sample group. According to the results of the ANOVA analysis, local spectators of both mega sport events displayed significant differences in all dimensions composing the effect of mega events.

With regard to the positive effects of the *Winter Universiade*, the participants with a Master's degree were more positive about "improving the city image" dimension (Mean=4.39), "economic benefits" dimension (Mean=4.42) and on the "environmental and cultural protection" dimension (Mean=4.36). Those with an associate's degree or certificate were more positive on the "development of tourism sub-structure" dimension (Mean=4.58); and on the "cultural exchange" dimension (Mean=4.50). With regard to the negative effects of the *European Youth Olympic Festival* mega sport event, the participants with a Master's degree revealed more positive views on the "economic expenses" dimension (Mean=3.97), while the "social and environmental problems" dimension (Mean=4.36) was more positive for those participants with a primary education. The participants with an associate's degree or certificate were more positive regarding the "cultural problems and conflict" dimension (Mean=4.51).

With regard to the positive effects of the *European Youth Olympic Festival*, the participants with an associate's degree or certificate revealed more positive views on "improving the city image" (Mean=4.33), and on the "development of tourism substructure" (Mean=4.65), compared to participants with a Master's degree who were more positive about the "economic benefits" dimension (Mean=4.28), the "cultural exchange" dimension (Mean=4.43), and the "environmental and cultural protection" dimension (Mean=4.30).

Concerning the negative effects of the *Winter Universiade*, participants with a primary education were more positive about the "economic expenses" dimension (Mean=3.88), participants with a master's degree about the "social and environmental problems" (Mean=4.37), and those with an associate's degree or certificate about "cultural problems and conflict" (Mean=3.95).

**Occupation**

An ANOVA analysis was applied in order to determine whether the effects of the *Winter Universiade* and the *European Youth Olympic Festival* mega sport events revealed statistically significant differences based on the occupations of the sample group. According to the results of the ANOVA analysis, the local spectators of both mega sport events

displayed significant differences in all dimensions composing the effect of mega events.

With regard to the positive effects of the *Winter Universiade* mega sport event, students revealed more positive views on the "improving the city image" dimension (Mean=4.70); the craftsmen on the "development of tourism substructure" dimension (Mean=4.30) and on the "economic benefits" dimension (Mean=4.30); students on the "cultural exchange" dimension (Mean=4.45); and finally civil servants, on the "environmental and cultural protection" dimension (Mean=4.39).

***TABLE 3*: DIFFERENTIATION DIMENSIONS OF MEGA EVENT IMPACT SCALE ACCORDING TO OCCUPATIONS**

| Dimensions | Events | Occupation | n | M | SD | t-value | p-value |
|---|---|---|---|---|---|---|---|
| City image enhancement & consolidation | W. Univ. | Student | 157 | 4.70 | 0.3245 | 4.124 | 0.012* |
| | EYOF | Workers | 32 | 4.36 | 0.4834 | 3.745 | 0.025* |
| Tourism infrastructure development | W. Univ. | Artisan | 16 | 4.30 | 0.5642 | 3.985 | 0.001** |
| | EYOF | Workers | 32 | 4.51 | 0.4825 | 4.567 | 0.001** |
| Economic benefits | W. Univ. | Artisan | 16 | 4.30 | 0.5456 | 5.978 | 0.001** |
| | EYOF | Housewives | 14 | 4.28 | 0.3935 | 4.687 | 0.001** |
| Cultural exchange | W. Univ. | Student | 157 | 4.45 | 0.6425 | 6.185 | 0.015* |
| | EYOF | Housewives | 14 | 4.33 | 0.4451 | 4.821 | 0.001** |
| Environment & culture preservation | W. Univ. | Officer | 128 | 4.39 | 0.4572 | 3.942 | 0.031* |
| | EYOF | Housewives | 14 | 4.50 | 0.4082 | 4.983 | 0.001** |
| Economic costs | W. Univ. | Officer | 128 | 4.39 | 0.7452 | 3.118 | 0.006* |
| | EYOF | Housewives | 14 | 3.97 | 0.4867 | 4.989 | 0.001** |
| Social & environmental problems | W. Univ. | Freelancers | 28 | 4.24 | 0.8456 | 4.453 | 0.011* |
| | EYOF | Housewives | 14 | 4.38 | 0.3460 | 2.367 | 0.014* |
| Culture conflicts | W. Univ. | Housewives | 8 | 4.49 | 0.5421 | 4.158 | 0.001** |
| | EYOF | Workers | 32 | 3.98 | 0.7689 | 2.354 | 0.012* |

W. Univ.= Winter Universiade EYOF= European Youth Olympic Festival M= Mean SD= Standard Deviation
* $p<0.05$ ** $p<0.01$

With regard to the negative effects of the *Winter Universiade* mega sport event, self-employed participants revealed more positive views on the "economic expenses" dimension (Mean=4.24); the housewives on the "social and environmental problems" dimension (Mean=4.49); and workers, on the "cultural problems and conflict" dimension (Mean=3.98). With regard to the positive effects of the *European Youth Olympic Festival* mega sport event, workers revealed more positive views on the "improving the city image" dimension (Mean=4.36) and on the "development of tourism substructure" dimension (Mean=4.51); housewives on the "economic benefits" dimension (Mean=4.28), the "cultural exchange" dimension (Mean=4.33), and on the "environmental and cultural protection" dimension (Mean=4.50). With regard to the negative effects of the *European Youth Olympic Festival*, housewives revealed more positive views on the "economic expenses" dimension

(Mean=3.97) and on the "social and environmental problems" dimension (Mean=4.38). Workers were more positive on the "cultural problems and conflict" dimension (Mean=3.98).

**Income status**

An ANOVA analysis was applied in order to determine whether the effects of the *Winter Universiade* and the *European Youth Olympic Festival* mega sport events revealed

statistically significant differences according to different monthly incomes in the sample group. According to the ANOVA analysis, the local spectators of the *Winter Universiade* displayed significant differences in the dimensions of "improving the city image", "cultural exchange", "social and environmental problems", and "cultural problems and conflict", while the local spectators of the *European Youth Olympic Festival* mega sport event displayed significant differences in the dimensions of "improving the city image", "environmental and cultural protection", and "social and environmental problems".

***TABLE 4*: DIFFERENTIATION DIMENSIONS OF MEGA EVENT IMPACT SCALE ACCORDING TO INCOME STATUS**

| Dimensions | Events | Occupation | n | M | SD | t-value | p-value |
|---|---|---|---|---|---|---|---|
| City image enhancement & consolidation | W. Univ. | 3001-3750 | 33 | 40.09 | 0.5842 | 30.884 | 0.002* |
| | EYOF | 3001-3750 | 88 | 40.33 | 0.5372 | 20.099 | 0.004* |
| Tourism infrastructure development | W. Univ. | 3751≥ | 20 | 40.21 | 0.5149 | 0.004 | 0.075 |
| | EYOF | 1501-2250 | 113 | 40.37 | 0.5714 | 0.212 | 0.957 |
| Economic benefits | W. Univ. | ≤750 | 85 | 40.37 | 0.4754 | 10.430 | 0.210 |
| | EYOF | 3751≥ | 97 | 40.13 | 0.5815 | 0.280 | 0.924 |
| Cultural exchange | W. Univ. | 2251-3000 | 71 | 40.41 | 0.6195 | 20.368 | 0.038* |
| | EYOF | 1501-2250 | 113 | 40.18 | 0.6338 | 10.040 | 0.394 |
| Environment & culture preservation | W. Univ. | 3751≥ | 20 | 40.38 | 0.5855 | 10.146 | 0.334 |
| | EYOF | 3751≥ | 97 | 40.44 | 0.5220 | 10.878 | 0.047* |
| Economic costs | W. Univ. | ≤750 | 85 | 40.38 | 0.5931 | 10.703 | 0.131 |
| | EYOF | 2251-3000 | 89 | 30.87 | 0.6818 | 0.725 | 0.605 |
| Social & environmental problems | W. Univ. | 3751≥ | 20 | 40.24 | 0.6255 | 90.445 | 0.001** |
| | EYOF | 2251-3000 | 89 | 40.36 | 0.5148 | 20.456 | 0.040* |
| Culture conflicts | W. Univ. | 3751≥ | 20 | 40.61 | 0.6228 | 20.614 | 0.023* |
| | EYOF | 3751≥ | 97 | 30.90 | 0.7715 | 0.725 | 0.605 |

W. Univ.= Winter Universiade EYOF= European Youth Olympic Festival M= Mean SD= Standard Deviation
* $p<0.05$ ** $p<0.01$

Participants of the *Winter Universiade* with a monthly income of 3,001-3,750Turkish Liras revealed more positive views on the "improving the city image" dimension (Mean=4.09) and on the "cultural exchange" dimension (Mean=4.41) as positive effects compared to the others. With regard to the negative effects, participants with a monthly income of

3751Turkish Liras or more revealed more positive views on the "social and environmental problems" dimension (Mean=4.24) and on the "cultural problems and conflict" dimension (Mean=4.61) compared to the others.

Concerning the positive effects of the *European Youth Olympic Festival*, participants with a monthly income of 3,001-3,750Turkish Liras revealed more positive views on "improving the

city image" (Mean=4.33) and on "environmental and cultural protection" (Mean=4.51) compared to the others. A negative effect of the *European Youth Olympic Festival* was viewed more positively by participants with a monthly income of 2,250-3,000Turkish Liras relating to the "social and environmental problems" dimension (Mean=4.36) compared to the others.

## DISCUSSION

Mega sport events are held one time on an international scale (Jones, 2001; Simsek, 2011). Such events have expectations on a mega scale from the perspective of the participants. It creates a target market (offering an international tourism market), requires financial investment from society, ensures facilities to be built for the event, and furthermore, ensures the potential of tourism, media coverage, international recognition and economic benefits, which come into the picture for the host country (Burgan & Mules, 1992). It cannot be denied that mega sport events have a great power likely to create the potential of tourism mobility, media coverage and international recognition (Chalip, 2007).

Another feature of mega sport events is the fact that they strengthen the travel image of the entire country (Jones, 2001). The travel image accompanying mega sport events is of vital importance in terms of both attracting visitors and enhancing re-visit rates for the host city. The size of mega sport events is gigantic and can provide such significant effects. As a result, the attraction and participation of individuals to these events increases in the same way. Mega sport events are held one time only and they generally create both positive (city image, tourism substructure, economic benefit, cultural exchange and environmental and cultural protection) and negative (economic expenses, social and environmental problems, cultural conflict) profound long-term effects (Simsek, 2011). Mega sport events are the most exciting and fastest growing examples of economic and tourism events in several countries and destinations.

When the perspectives of the local spectators of the *Winter Universiade* held in Erzurum, were analysed, it was observed that the views on the economic benefits, environmental and cultural protection, as well as social and environmental problems created by the event significantly differed according to gender. Men believed that the mega sport events have more economic contributions, while women believed the environmental contribution to be greater. Furthermore, compared to men, women more frequently discussed the presence of problems and cultural conflicts, which is one of the negative effects of a mega event. The opinion that the *European Youth Olympic Festival* held in 2011 in Trabzon contributed to the image of Trabzon was viewed more positively by women than men. The women were in agreement that the economic expense of the *European Youth Olympic Festival* as mega sport event to be excessive.

When the effects of mega sport events were compared based on the educational levels of the

participants, a difference was observed in all of the dimensions. When the viewpoints of the local spectators of both mega sport events were analysed, the most striking finding was significant differences among local spectator viewpoints regarding social and environmental problems based on educational level. For both of the events, the differences related to creating social and environmental problems were noteworthy among participants according to

the various educational levels. Participants with a primary school education, who attended the *Winter Universiade* as spectators and participants with a master's degree, who attended the *European Youth Olympic Festival* as spectators, stated that the relevant event created social and environmental problems.

One of the most remarkable viewpoints of the local spectator of the *Winter Universiade* was the fact that a great majority of the local spectators with a primary education stated that the event did not make a contribution to the sub-structural development of tourism, compared to participants with a certificate and those with a master's degree. Accordingly, the local spectators with a high school or equivalent education level, who attended the *European Youth Olympic Festival* mega sport event as spectators stated that the event was not likely to make any contribution to the tourism sub-structure.

Current research reports that mega events cover a fully intensified destination image and have certain effects for the host societies (Gelan, 2003). Events and the subsequent developments in tourism are related to the perceived expense, rather than the perceived benefit of mega sport events (Jeong, 1998; Fredline & Faulkner, 2000). However, mega events have long-term positive benefits for the cities. Such events are reported to develop tourism (Long *et al*., 1990), offer international recognition and promotion opportunities for the host country (Kim & Petrick, 2005), and improve the standard of living of the society (Etchner & Ritchie, 1993; Gundogdu & Devecioglu, 2008). If the local community perceives the development of tourism as an opportunity for recreational activity or utilisation of modern facilities, then their contribution to and support for the mega events would increase (Allen *et al*., 1993).

When the effects of mega sport events were compared according to the occupations of the participants, all of the dimensions differed. The viewpoints of the local spectators of both of these mega sport events produced a significant difference in the dimensions of development of the tourism sub-structure and economic benefits. Craftsmen participants in the *Winter Universiade* and worker participants in the *European Youth Olympic Festival* voiced more positive perspectives on the contribution of the event to the tourism sub-structure. Similarly, craftsmen participants in the *Winter Universiade* and homemaker participants in the *European Youth Olympic Festival* revealed more positive perspectives on ensuring economic benefits for city and its people.

Crompton (2000) studied the economic effect of mega events, in terms of individual income and finding jobs. It was revealed that such events can effectively create economic benefits as expected by the host countries (Dyer *et al*., 2007). Similarly, Jones (2001) studied the social and economic effects of mega events. The researcher attributes the effects of mega sport events on producing social and economic outputs to several factors, stating that these factors include, but are not limited to: the nature of media coverage of the mega sport events; and perceived success and structure of the event. Hence, the results of the real effects may not be positive or negative as presumed by the visitors/consumers.

The effects of the *Winter Universiade* were compared according to the levels of income of the participants, and significant differences were observed in the dimensions of improving and strengthening the city image, cultural exchange, social and environmental problems, as well as the dimension of cultural problems and conflict. The most striking findings were the perspective of participants with a monthly income of 1,501-2,250Turkish Liras, stating that the event does not make solid contributions to develop and strengthen the image of the city, while the viewpoint of the participants with a monthly income of 751-2,250Turkish Liras believed that the event creates social and environmental problems, which is one of the negative effects. The effects of the *European Youth Olympic Festival* event were compared and significant differences were observed in the dimensions of improving the city image, environmental and cultural protection and social and environmental problems. However, the most astonishing finding is the significantly high positive viewpoints, regarding the dimension "improving the city image", held by the participants with a monthly income of 3,001-3,750Turkish Liras.

The positive and negative effects of mega events can be classified according to their economic, tourism/trade related, physical, socio-cultural, psychological, and political characteristics. Apart from the economic benefits of visitor spending, mega events offer travel and tourism destinations, new opportunities for investors and new trade activities in regulatory society, in terms of creating regional or international dominance (Burgan & Mules, 1992). It also includes the improvement of the quality of life and image of the local society that can be attributed to being an international host (Etchner & Ritchie, 1993; Gundogdu & Devecioglu, 2008). For the host country, mega events may result in acquiring a weak reputation as a result of poor or non-professional organisation and inadequate facilities or it may damage the image of the host society (Searle, 2002). Studies show that the positive perceptions regarding the development in sub-structures and super-structures bear importance, provided that the facilities remaining after mega events are used by the local society (Kendall & Var, 1984; Talimciler, 2002; Tosun, 2002).

## CONCLUSION

Research findings were analysed in general, and the following results were obtained. Significant differences were detected in most of the dimensions of the effects of the mega sport events, the *Winter Universiade* and the *European Youth Olympic Festival*, according to the demographic characteristics of the sample group. The demographic characteristic with the least difference is the monthly income of the local spectators at the events. Averages of the viewpoints of the sample group, regarding both positive and negative effects of each event, were high. In other words, both positive and negative effects were detected not only in the *Winter Universiade* held in Erzurum, but also in the mega sport event, the *European Youth Olympic Festival* held in Trabzon.

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# ENHANCING JUMP GROUND REACTION FORCES IN CHILDREN THROUGH JUMP TRAINING

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***ABSTRACT***

*Plyometric training is a popular form of exercise training and is often included in exercise programmes and tests for children. As such, the aim of the study was to determine the effect of different types of plyometric jumps on jump performance in children. Forty children were randomly assigned into either one of three experimental groups: Group 1, mean age 13.80±1.23, (training based on jumps) (JUM); Group 2, mean age, 13.50±0.97 (training based on hops) (HOP); Group 3, mean age, 13.90±1.20 (training based on box drills) (BOX); Group 4, mean age 13.90±1.20 (non-exercising control group) (CON). Training lasted nine weeks. Jump ground reaction forces were assessed using: counter-movement jump (CMJ), continuous jump with bent legs (CJb) and drop jump (DJ). This study elicited significant ($p \leq 0.05$) improvements in jump height in all test jumps (CMJ, CJb and DJ) in the JUM, HOP and BOX. Furthermore, the JUM and HOP resulted in increases in jumping power during CMJ and CJb with only the BOX improving jump power during the DJ. Only the JUM resulted in significant increases in jump force during the CMJ. These improvements following simple jumps requiring minimal equipment strongly support the use of jump training to enhance athletic performance in children.*

**Key words:** Jump intervention; Plyometric training; Jump performance; Children; Stretch-shortening exercises.

## INTRODUCTION

Plyometric training is a popular form of exercise training (Markovic & Mikulic, 2010), and is often included in exercise programmes and tests for children and adolescents (Taylor *et al.*, 2010). In this regard, plyometric training is considered a safe and effective mode of training for children (Johnson *et al.*, 2011). Plyometric training of children has demonstrated to elicit positive changes in the neural and musculo-skeletal systems, muscle function and athletic performance and to reduce injuries in children (Markovic & Mikulic, 2010).

Leg muscle power and jump performance are considered essential factors for successful completion of daily living activities (Bassey *et al.*, 1992), occupational tasks (Kraemer *et al.*, 2001) and athletic performance (Bobbert, 1990; Canavan & Vescovi, 2004). In terms of athletic performance, plyometric training has been shown to increase kicking distance and

improve balance, agility, ability to jump and run in children (Kontulainen *et al.,* 2002; Markovic & Mikulic, 2010; Johnson *et al.,* 2011). According to Kontulainen *et al.* (2002), jump training can increase the mineral density of bones in girls, which is essential since childhood is a critical time to enhance bone mass and strength (Bailey *et al.,* 1999; MacKelvie *et al.,* 2003).

## RESEARCH PROBLEM

There is limited information available regarding the type of plyometric training required to improve jump performance in children (Diallo *et al.,* 2001; Taylor *et al.,* 2010). In addition there is limited information about the adaptability of children with respect to different workloads and the differences in performance among the various types of jumps (Bassa *et al.,* 2011). Therefore, the aim of the present study was to determine the training effect of different types of plyometric jumps on jump performance in children.

## METHODS

### Participants

Forty children (12 boys and 28 girls) participated in this study (Table 1). Sample size was calculated using PS Power and Sample Size Calculation version 2.1.30. The power of the study was set at 80% with a confidence level of 95%, while the standard deviation observed was 0.06 (Bobbert *et al.,* 1986). Differences in population means were set at 0.08 and the estimated sample size was 10 participants per group.

***TABLE 1*: BASELINE DESCRIPTIVE (Mean±SD) DATA OF PARTICIPANTS**

| **Variables** | **Jump-train. Gr. (JUM)** (n = 10) | **Hop-train. Gr. (HOP)** (n = 10) | **Box drill-train. Gr. (BOX)** (n=10) | **Non-exercise Gr. (CON)** (n=10) |
|---|---|---|---|---|
| Age (years) | 13.80±1.23 | 13.50±0.97 | 13.90±1.20 | 13.90±1.20 |
| Height (cm) | 152.90±4.32 | 152.90±6.63 | 151.35±7.74 | 152.07±6.55 |
| Weight (kg) | 46.10±5.23 | 44.30±4.71 | 48.44±12.55 | 47.28±9.78 |
| BMI ($kg \cdot m^{-2}$) | 19.67±1.50 | 18.93±1.37 | 20.95±4.29 | 20.39±3.51 |

Participants were stratified by gender and randomly assigned using a random numbers table for either 1 of 3 experimental groups: Group 1 (training based on jumps) (JUM); Group 2 (training based on hops) (HOP), Group 3 (training based on box drills) (BOX) and Group 4 (non-exercising group) (CON) served as a control group. Ethical clearance was obtained from the Universiti Sains Malaysia's institutional review board. Each participant's parents/guardians signed an informed consent form, while the participants themselves also gave consent. All participants underwent a screening history before participation and were informed of all possible experimental risks and discomforts of participating in this investigation.

As inclusion criteria for participation, the following requirements were set: to be sedentary;

aged between 13 to 17 years; free from any serious injury and health problems prohibiting exercise; have a stature above 140cm; have a body mass of more than 30kg; have a body mass index (BMI) of between 15.0 and 29.9 $kg.m^{-2}$; and have no history of plyometric training. There were no significant ($p>0.05$) differences between intervention and non-exercising control group with respect to age, stature, body mass and body mass index (BMI). Each group consisted of 3 boys and 7 girls. Each participant was requested: not to exercise before the testing session; schedule study visits at the same time of the day for both sessions; and to wear the same athletic shoes for each session.

**Anthropometric measurements**

After informed consent procedures were completed, body mass and stature were measured to the nearest 0.01kg and nearest 0.25cm measured using a SECA body meter (SECA, Model 707 1314004, Vogel & Halke, Hamburg, Germany). In addition to measuring the body mass and stature of the participants, these indices were used to calculate BMI for descriptive purposes.

**Ground Reaction Force measurements**

Participants were, in a random order, required to perform three types of jumps. The jumps performed were the counter-movement jump (CMJ) (Diallo *et al.,* 2001; Taylor *et al.,*2010), the continuous jump with bent legs (CJb) and the drop jump (DJ) (Diallo *et al.,*2001; Santos & Janeira, 2008). Force plate data were captured using a force platform (Quattro Jump one-component Force Plate System for Jump Performance Measurement in Sports, Type 9290AD, Kistler Instrumente AG Winterthur, Switzerland), and laptop (Hewlett Packard, Palo Alto, California, USA).

The counter-movement jump (CMJ) required the participant to stand upright for 1 to 2 seconds with hands resting on the hips (in an attempt to measure leg performance instead of arm performance). When instructed to do so, the participant jumped maximally. Participants then landed on the force plate and stood still for 1 to 2 seconds before once again jumping maximally. When performing the continuous jump with bent legs (CJb), each participant began in the upright position for 1 to 2 seconds with their hands resting on their hips. The participant then jumped 5 times continuously for maximum height. With every jump, the participant would bend their knees to approximately 90° during the contact phase, which was controlled by the research technician. No standing still period was required at the completion of the test. The drop jump (DJ) was performed from a 30.48cm high step-up box adjacent to the force plate. Participants were asked to step down from the box with their hands affixed to their hips (minimising the contribution of the arms), by landing with both legs on the force platform and jumped maximally before landing and remaining upright for 1 to 2 seconds. Each participant performed two trials for each type of jump at each testing session and the average from these trials was used for data analysis.

**Training programmes**

Participants participated in a 9-week training programme consisting of either training based on jumps (JUM), hops (HOP) or box drills (BOX), in accordance with the guidelines of the National Strength and Conditioning Association (Baechle & Earle, 2000), and other recommendations (Bobbert, 1990; Johnson *et al.,* 2011) (Table 2). Prior to participation, the participants were familiarised with the equipment and the correct plyometric techniques,

especially to ensure an effective amortisation phase. The familiarisation involved 12 warm-up jumps and then a number (4±2 trials) of increasingly higher intensity jumps on until the participant felt comfortable with the techniques. The participants were asked to replicate the procedures on the second testing session, which occurred within 7 days of the first session.

***TABLE 2*: SUMMARY OF INTERVENTION PROGRAMME**

| **Jump-training Gr. (JUM)** (n=10) | | **Hop-training Gr. (HOP)** (n=10) | | **Box-drill-train. Gr. (BOX)** (n=10) | |
|---|---|---|---|---|---|
| **Jumping exercises** | Sets x Reps | **Hopping exercises** | Sets x Reps | **Box-jump exercises** | Sets x Reps |
| Squat jump | 2x10 | Double leg hop | 2x5 | Box jump-single response | 2x10 |
| Split squat jump | 2x8 each leg | Side hop | 2x10 | Depth jump | 2x10 |
| Star jump | 2x8 | Front cone hops | 2x10 | Single leg push off | 2x20 |
| Rocket jump | 2x8 | Cone hops with 180 degree turn | 2x8 | Alternating push off | 2x20 |
| Split squat with cycle | 2x10 | Single foot side-to-side ankle hop | 2x10 | Lateral box jump | 2x10 |
| Standing jump over barrier | 1x10 | Side-to-side ankle hop | 2x10 | Side-to-side box shuffle | 2x10 |
| Standing jump and reach | 1x6 | Single leg hop | 2x10 | Lateral step-up | 2x15 each leg |
| Scissors jump | 2x8 | Diagonal cone hops | 2x5 | Front box jump | 2x10 |
| Pogo | 2x10 | Two foot ankle hops | 2x10 | Jump to box | 2x10 |

Reps= Repetitions

Participants trained as follows: for 1 hour per session once weekly for week 1 to 3; twice weekly for weeks 4 to 6; and thrice weekly for weeks 7 to 9. Each session included a warm-up (15 minutes), a main part consisting of 9 exercises (35 minutes) performed maximally and had a 1to 3 minute rest period between each set and a cool-down (10 minutes). As plyometric exercises were performed to each participant's maximal effort, relative intensity remained consistent for the 9 weeks and allowed individual progression and the ability to cope with the plyometric exercises initially. This uniform intensity combined with the 35-minute exercise duration ensured a standardised plyometric programme for each participant. No intervention programme was administered to the control group. All participants in the control group were advised not to participate in any other regular physical exercises and to continue with their normal activities of daily living throughout the 9 weeks.

**Statistical analysis**

All jump height, jump power and jump force data were screened for normality assumptions

using the Shapiro-Wilks test and histograms where the normality curve was used to indicate whether the data was normally distributed. Differences in measurements were compared using a one-way analysis of variance (ANOVA) and statistical significance set at $p \leq 0.05$. Pre-test, mid-test 1 (assessed at week 3), mid-test 2 (assessed at week 6) and post-test data were reported as means±standard deviations. Included in the statistical analyses was the utilisation of percentage change to illustrate relative changes observed from pre- to post-test for each of the plyometric programmes. Data were analysed using the Statistical Package for Social Sciences (SPSS) Version 14.0 (Chicago, IL).

## RESULTS

### Jump Height

Table 3 shows the jump height for the counter-movement jump (CMJ), the continuous jump with bent legs (CJb) and the drop jump (DJ) during pre-test, mid-test 1, mid-test 2 and post-test for the 4 groups involved in the study. In this regard, there were significant improvements in jump height when training was based on jumps (JUM) for CMJ, CJb and DJ. For the training group based on box drills (BOX), significant differences in jump height were found between tests in CMJ, CJb and DJ. There were significant differences in jump height in CMJ, CJb and DJ in the CON.

Further analysis of the jump height during the CMJ for the 4 groups indicated a significant improvement in jump height during mid-test 2 between the BOX and CON ($p<0.001$), JUM and CON ($p<0.01$), HOP and CON ($p<0.01$) and BOX and CON ($p<0.01$). During mid-test 1 a significant ($p<0.05$) difference was found for jump height during the CMJ between the HOP and CON and JUM and BOX.

For jump height for the 4 groups, a significant difference was found between the HOP and CON during mid-test 1 ($p<0.05$), mid-test 2 and post-test ($p<0.01$). There was also a significant difference between the BOX and CON during mid-test 2 ($p<0.05$) and post-test ($p<0.01$). The JUM and CON were found to be significantly different during post-test ($p<0.01$). For DJ there were no significant differences between the groups during pre-test, mid-test 1, mid-test 2 and post-test.

***TABLE 3*: MEAN±SD FOR JUMP HEIGHT DURING CMJ, CJb AND DJ DURING PRE-TEST, MID-TEST 1, MID-TEST 2 AND POST-TEST**

| **Groups** (n=10 in each) | **Pre-test (cm)** (M±SD) | **Mid-test 1 (cm)** (M±SD) | **Mid-test 2 (cm)** (M±SD) | **Post-test (cm)** (M±SD) | **Mean % change** |
|---|---|---|---|---|---|
| *Jump* | | | | | |
| CMJ | 26.89±4.37 | **29.25 ±4.08**** | **32.42±4.85†††,++** | **34.51±4.07‡‡‡,§§§,¤¤** | 28.34 |
| CJb | 23.30±4.85 | **25.32 ±5.07**** | **26.96±5.33††** | **30.52±5.79‡‡‡,§§§,¤¤¤** | 30.99 |
| DJ | 19.21±3.18 | 20.42 ±2.83 | **21.70±3.48†,+** | **24.41±5.44‡,§§,¤** | 12.96 |
| *Hop* | | | | | |
| CMJ | 26.04±6.77 | **31.09 ±6.86***** | **32.95±6.82†††,++** | **36.13±6.70‡‡‡,§§§,¤¤¤** | 38.75 |
| CJb | 24.70±4.85 | **27.42 ±5.23**** | **28.50±6.14††** | **29.98±6.44‡‡‡,§§,¤¤** | 21.38 |
| DJ | 20.71±3.57 | **22.71 ±4.32**** | **23.81±5.60†** | **26.23±7.33‡‡,§,¤** | 26.65 |

| | | | | | |
|---|---|---|---|---|---|
| *Box* | | | | | |
| CMJ | 27.81±5.17 | **31.03 ±4.97*** ** | **33.44±3.31†† ** | **35.41±3.32‡‡‡,§§,¤¤** | 27.33 |
| CJb | 24.47±4.69 | **26.71 ±4.88** ** | **27.94±4.45††,++** | **30.06±3.76‡‡‡,§§,¤¤** | 22.84 |
| DJ | 18.79±3.43 | **22.61 ±5.00** ** | **22.57±3.63†** | **26.05±4.67‡‡,§,¤¤** | 38.64 |
| *Control* | | | | | |
| CMJ | 28.11±6.18 | 28.15 ±5.25 | 27.62±5.55 | 29.40±4.54¤¤ | 4.59 |
| CJb | 22.54±4.26 | 22.97 ±4.29 | **23.90±4.61†** | **24.78±4.75‡,¤** | 9.94 |
| DJ | 18.01±3.92 | 18.98 ±3.95 | 19.88±4.00 | **20.72±3.82§** | 15.05 |

CMJ= Counter movement jump; CJb= Continuous jump with bent legs; DJ= Drop jump
M±SD= Mean±Standard deviation Mean % change= Mean percentage change from pre- to post-test
**= Between pre and mid-test 1 (p<0.01); += Between mid-test 1 and mid-test 2 (p<0.05);
***= Between pre and mid-test 1 (p<0.001); ++= Between mid-test 1 and mid-test 2 (p<0.01);
†= Between pre and mid-test 2 (p<0.05); §§= Between mid-test 1and post-test (p < 0.01);
§= Between mid-test 1and post-test (p<0.05); ††= Between pre and mid-test 2 (p<0.01);
§§§= Between mid-test 1and post-test (p < 0.001); †††= Between pre and mid-test 2 (p<0.001);
¤= Between mid-test 2 and post-test (p<0.05); ‡= Between pre and post-test (p<0.01);
¤¤= Between mid-test 2 and post-test (p<0.01); ‡‡‡= Between pre and post-test (p<0.001);
¤¤¤= Between mid-test 2 and post-test (p<0.001)

**Average Jump Power**

Table 4 shows the jump power for CMJ, CJb and DJ during pre-test, mid-test 1, mid-test 2 and post-test for the 4 groups involved in the study. In the CON no significant differences were found in average jump power between any of the tests.

Further analysis also revealed that there were significant differences in average jump power during the CMJ between the JUM and CON (p<0.01), HOP and CON (p<0.05) during mid-test 1, whereas significant differences were found between the JUMP and CON (p < 0.01), HOP and CON (p < 0.01) and BOX and CON (p < 0.05). At post-test, a significant difference was found between the JUMP and CON (p<0.001), HOP and CON (p < 0.001) and BOX and CON (p < 0.01). However, no significant differences for average jump power were found for CJb and DJ during pre-test, mid-test 1, mid-test 2 and post-test were elicited between any of the groups.

***TABLE 4*: MEAN±SD FOR JUMP POWER DURING CMJ , CJb AND DJ DURING PRE-TEST, MID-TEST 1, MID-TEST 2 AND POST-TEST**

| **Groups** (n=10 in each) | **Pre-test W.kg$^{-1}$** (M±SD) | **Mid-test 1 W.kg$^{-1}$** (M±SD) | **Mid-test 2 W.kg$^{-1}$** (M±SD) | **Post-test W.kg$^{-1}$** (M±SD) | **Mean % change** |
|---|---|---|---|---|---|
| *Jump* | | | | | |
| CMJ | 20.37±2.92 | **22.08±3.43** ** | **21.70±2.45†** | **22.25±2.73‡** | 9.23 |
| CJb | 17.93±2.06 | **20.19±1.91*** ** | **20.10±2.38†** | **20.79±2.61‡‡,¤** | 15.95 |
| DJ | 17.69±4.38 | 20.29±3.53 | 18.96±2.59 | 20.49±3.22 | 15.83 |
| *Hop* | | | | | |
| CMJ | 20.19±2.62 | 20.89±3.42 | 21.88±4.29 | **22.36±4.26‡,§** | 10.75 |
| CJb | 18.58±2.65 | **20.79±3.11** ** | **21.03±4.32†** | **20.94±4.36‡** | 12.70 |
| DJ | 19.96 ± 3.22 | 20.18±3.23 | 21.30±4.33 | 22.27±5.31 | 11.57 |
| *Box* | | | | | |

| | | | | | |
|---|---|---|---|---|---|
| CMJ | 20.96±3.33 | 21.35±3.84 | 21.41±2.55 | **22.23±3.05‡** | 6.06 |
| CJb | 20.19±7.00 | 20.37±4.58 | **21.37±4.82+** | 20.75±2.15 | 2.77 |
| DJ | 18.61 ± 4.62 | **21.54±4.99**** | 21.41±5.10 | **23.16±7.71‡** | 24.44 |
| *Control* | | | | | |
| CMJ | 20.21±2.79 | 19.25±3.30 | 19.15±2.91 | 19.17±2.10 | 5.15 |
| CJb | 17.77±3.02 | 17.69±2.67 | 18.65±3.25 | 18.53±2.62 | 4.28 |
| DJ | 16.73±3.91 | 17.31±3.55 | 17.59±3.55 | 17.82±2.37 | 6.52 |

CMJ= Counter movement jump; CJb= Continuous jump with bent legs; DJ= Drop jump
M±SD= Mean±Standard deviation Mean % change= Mean percentage change from pre- to post-test
**: Between pre-test and mid-test 1 (p<0.01); +: Between mid-test 1 and mid-test 2 (p<0.05);
***: Between pre-test and mid-test 1 (p<0.001); §: Between mid-test 1and post-test (p<0.05);
†: Between pre-test and mid-test 2 (p<0.05); ¤: Between mid-test 2 and post-test (p<0.05);
‡: Between pre-test and post-test (p<0.05); ‡‡: Between pre-test and post-test (p<0.001)

**Jump Force**

Table 5 shows the jump force for CMJ, CJb and DJ during pre-test, mid-test 1, mid-test 2 and post-test for the 4 groups involved in the study. The findings of the analysis indicated that there were significant differences in average force during the CMJ between mid-test 1 and mid test 2 (p<0.05), mid-test 1 and post-test (p<0.05), and during the CJb between pre- and mid-test 1 (p<0.01). However, no significant differences were found between the groups.

***TABLE 5*: MEAN±SD FOR JUMP FORCE OF CMJ, CJb AND DJ DURING PRE-TEST, MID-TEST 1, MID-TEST 2 AND POST-TEST**

| **Groups** (n=10 in each) | Pre-test %BW (M±SD) | Mid-test 1 %BW (M±SD) | Mid-test 2 %BW (M±SD) | Post-test %BW (M±SD) | **Mean % change** |
|---|---|---|---|---|---|
| *Jump* | | | | | |
| CMJ | 1.27±0.34 | 1.38±0.35 | **1.22±0.26+** | **1.16±0.14§** | 8.66 |
| CJb | 1.42±0.64 | **1.61±0.58**** | 1.38±0.72 | 1.19±0.48 | 16.20 |
| DJ | 1.31±0.66 | 1.66±0.86 | 1.15±0.59 | 1.07±0.45 | 18.32 |
| *Hop* | | | | | |
| CMJ | 1.19±0.51 | 1.05±0.24 | 1.07±0.29 | 1.06±0.27 | 10.92 |
| CJb | 1.22±0.66 | 1.32±0.58 | 1.18±0.37 | 1.09±0.40 | 10.66 |
| DJ | 1.37±0.71 | 1.20±0.47 | 1.31±0.57 | 1.27±0.48 | 7.30 |
| *Box* | | | | | |
| CMJ | 1.31±0.51 | 1.15±0.42 | 1.08±0.27 | 1.11±0.26 | 15.27 |
| CJb | 1.64±1.22 | 1.33±0.64 | 1.40±0.61 | 1.07±0.17 | 34.76 |
| DJ | 1.47±0.62 | 1.46± 0.60 | 1.54±0.64 | 1.45±0.89 | 1.36 |
| *Control* | | | | | |
| CMJ | 1.13±0.20 | 1.02±0.19 | 1.00±0.18 | 1.00±0.16 | 11.50 |
| CJb | 1.26±0.38 | 1.15±0.28 | 1.23±0.19 | 1.11±0.27 | 11.90 |
| DJ | 1.12±0.43 | 1.13±0.33 | 1.06±0.25 | 1.07±0.28 | 4.46 |

CMJ= Counter movement jump; CJb= Continuous jump with bent legs; DJ= Drop jump; BW= Body weight
M±SD= Mean±Standard deviation Mean % change= Mean percentage change from pre- to post-test
**=Between pre- & mid-test 1 (p<0.01); += Between mid-test 1 & mid-test 2 (p<0.05);
§= Between mid-test 1 & post-test (p<0.05)

## DISCUSSION

Although there have been numerous plyometric interventions that have shown to augment jump performance, there is a dearth of data about the adaptability of children between the various jump types when used for training. This study elicited improvements in jump height in all test jumps (CMJ, CJb and DJ) in the JUM, HOP and BOX. Further, the JUMP and HOP resulted in increases in jump power during CMJ and CJb with only the BOX improving jump power during the DJ. Interestingly, only JUM resulted in significant increases in jump force during the CMJ.

These findings are consistent with the statements of Markovic and Mikulic (2010), who state that plyometric training has the potential to enhance jump performance in children. Further, the results of the present study are support the findings of Meylan and Malatesta (2009), who found that an eight-week plyometric training programme using pubertal children (N=14) showed significant increases in jump height during CMJ (7.9%). Diallo *et al.* (2001) also found significant increases CMJ and squat jump performance following a 10-week jump programme using pre-pubertal boys (N=20) while Kotzamanidis (2006) found significant increases in squat jump performance following a 10-week jump programme using prepubescent boys (N=15). Similar to the present study, following an eight-week plyometric training programme using pre-pubertal boys and girls (N=60), Bassa *et al.* (2011) found significant increases in jump height for CMJ, while Santos and Janeira (2008) reported significant increases in CMJ and squat jump following a 10-week weight and plyometric training programme using boys aged 14 to 15 years old N=25). Interestingly, both Bassa *et al.* (2011) and Santos and Janeira (2008), did not find any significant improvements in jump performance during DJ. Furthermore, Santos and Janeira (2008) found that varied jump heights up to 50cm elicit no difference in performance gain.

The associated data demonstrating that jump power improved in the JUM and HOP groups following CMJ and CJb and in the BOX group following DJ, shows that jump power predominantly improved, while jump force only improved in JUM following CMJ. Thus, increases in strength and speed of the concentric-eccentric phase could explain the increases in jump power. Further, kinematic and speed efficiencies could also have resulted in jump height improvements since plyometric exercise improves both the elastic nature of the muscles and tendons involved in jumping, together with neurological responses, and enhances speed and power by exploiting the reflex processes in the muscles to produce a more powerful contraction (Zatiorsky, 1995). Since the control group also demonstrated significant improvements in jump height, learning could have resulted in improvements from one test to the next. In this regard, the improvements observed in the jump height of the CON group could be explained by a learning effect in addition to improved coordination, control and neuromuscular recruitment. However, the effects of learning in the experimental group can be diminished since all variables would have improved consistently in the experimental group and since all the participants underwent the same familiarisation tests and number of jumps during testing.

## CONCLUSIONS

The purpose of this study was to evaluate the effects of nine weeks of three different types of

jump training on performance in children. The results of this study revealed that jump training produced beneficial changes in performance and these improvements in jump height, power and force adaptations, combined with the limited previous data strongly support the use of jump training to enhance athletic performance (jumping, sprinting, agility, etc.) in children. However, prior to participation, children should be adequately familiarised with the equipment and the correct plyometric techniques prior to embarking on such training.

## PRACTICAL APPLICATION

Training based on jumps and hops can elicit an increase in jump power, while training based on jumps increases jump force in children and as such could improve athletic performance through improved jump performance.

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# CLASSIFICATION OF MOUNTAIN BIKE TRAILS USING VEHICLE-PAVEMENT INTERACTION PRINCIPLES

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***ABSTRACT***

*Various mountain bike trails exist in South Africa, but their difficulty ratings are generally unknown. By classifying the trails, risk of injury and uncertainty can be limited as information are provided on the difficulty of the trail. In creating a Trail Classification System (TCS) the principles of Vehicle-Pavement Interaction (V-PI) can be applied to develop an objective evaluation of trail difficulty. The objective of this paper was to describe the different aspects that contribute to the degree of difficulty of a mountain bike trail and adopt an existing trail rating system through application of V-PI data. Based on the information in this paper, it is concluded that trail roughness affects the measured riding quality value of a section and trail gradient is the main contributor to difficulty of a mountain bike trail in terms of physical exertion. It is recommended that the proposed TCS be implemented on mountain bike trails.*

**Key words:** Mountain bike; Trail classification; Vehicle-pavement interaction.

## INTRODUCTION

Mountain biking is a sport or recreational activity that consists of a person riding over a rough terrain, using a specially adapted mountain bike. Mountain bikes are designed to enhance durability and performance on rough terrain. Mountain biking consists of multiple categories such as: cross country, trail riding, all mountain, downhill, free ride, dirt jumping and trails, with the majority of riders involved in cross country and trail riding (Clarke, 2002). Most of the trails in South Africa are natural jeep tracks, hiking trails or single track footpaths, and are found going through private land owners' farms which leave the cyclists at risk not knowing the trail ahead of them. By classifying the trails on a more rational basis, the

risk of injury and uncertainty can be limited for cyclists because they receive enough information on the difficulty of the trail.

The interaction of vehicle and pavement is an important aspect in transportation. In creating the Trail Classification System (TCS) the principles of Vehicle-Pavement Interaction (V-PI) can be applied to develop an objective evaluation of trail difficulty. Due to the popularity of mountain biking, trails are ridden everyday by newcomers to the sport of mountain biking. This increases the risk of injury due to cyclists trying to ride trails that they are not capable of, or trails unknown to them. The availability of a TCS for all types of mountain bike trails provides the cyclist with the necessary information, such as the surface type, maximum gradient and level of technical obstructions expected on the trail (Cessford, 1995; Pickering *et al*., 2010).

## OBJECTIVE AND BACKGROUND

The objective of this study was to describe the different aspects that contribute to the degree of difficulty on a mountain bike trail and adopt an existing trail rating system through application of V-PI principles.

### Mountain biking

The first mountain bike was a cruiser bicycle that was modified to enable cyclists to freewheel down mountain bike trails. The sport became popular in the 1970s in Marin County, California, USA. However, it was not until the late 1970s and early 1980s that road bicycle companies started to manufacture mountain bikes using lightweight materials. Throughout the 1990s and 2000s, mountain biking moved from a lesser-known sport to a mainstream activity complete with an international racing circuit and a world championship (Mountain Bike Hall of Fame, 2012).

A bicycle frame is the main part of a bicycle, onto which the wheels and all other components are attached (Figure 1). The geometry of a mountain bike varies based on the angle of the seat post and the head tube measured from the horizontal. Mountain bike frames are manufactured using materials such as carbon steel, steel alloys, aluminium alloys, titanium and carbon fibre (Sparks, 2007; Brown, 2012).

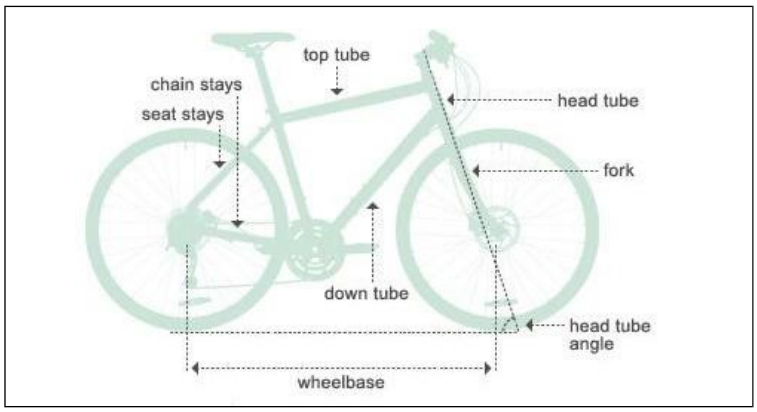

***FIGURE 1*: TYPICAL MOUNTAIN BIKE FRAME** (Brown, 2012:online)

Two major wheel sizes are used for mountain bikes. These are the traditional 26 inche wheel and the more recent 29 inche wheel. The 26 inche wheel has a rim diameter of 559mm while the 29 inche wheel rim size has a diameter of 622mm. It is customary to express the wheel diameter of mountain bikes in inches, and a specific mountain bike is often referred to in terms of its wheel diameter (26er or 29er). In this paper, the same custom is followed. The

motivation for the 29inche wheel size is mainly that it provides increased rotational inertia, providing more stability on the bicycle and making it easier to keep angular momentum when riding over small climbs and rough sections. It further decreases the approach angle of impact with larger obstacles (Ninerbikes, 2012).

Rolling resistance is affected by wheel diameter, width, pressure and tyre tread. When riding off-road mountain bike trails, these factors affect the cyclist's comfort and riding quality. Lower tyre inflation pressures and wider tyres are more suitable for mountain biking, but it increases rolling resistance due to the fact that small bumps and gravel bits are absorbed by the tyre, and subsequently increase cyclist comfort. Higher tyre inflation pressure decreases the rolling resistance, riding comfort and control of the cyclist (Nilges, 2005). Typical tyre inflation pressures for mountain bikes range between 200 and 325kPa (Khan, 2003).

Mountain bike suspensions can be divided into three categories: Rigid; Hardtail; and Full suspension. Rigid bikes have no suspension and are not very common in mountain biking. A Hardtail only has suspension at the front fork that absorbs shock from impact through coil or air compressed shocks. A full suspension mountain bike has a shock on the front fork and at the rear stays, the implementation of the rear shock improves comfort and riding quality when going downhill or passing over rocky sections due to the rear shock absorbing most of the impact (Wilson, 2004) (Figure 2).

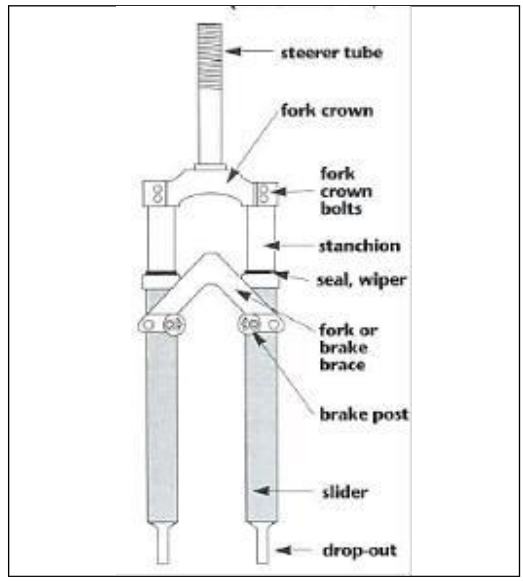

***FIGURE 2*: TYPICAL MOUNTAIN BIKE FRONT FORK SUSPENSION** (Sutherland, 1995:446)

Mountain biking is a sport undertaken on several ranges of public land tenures, such as protected areas, designated mountain bike trails, urban reserves, forests and commercial mountain bike parks. These terrains can be divided into three categories: Trail terrain; Technical terrain; and Advanced terrain (Pickering *et al*., 2010). Trail terrain consists of non-technical terrain sections, meaning no route selection through roots, rocks and other obstacles that require a higher level of skill. Trails on this terrain in general are partly paved or well compacted with a smooth riding surface. Typical trails that can be ridden in this terrain are open single tracks, fire roads, cycle ways, farm roads and urban reserves. Technical terrain consists of single tracks and routes that require some riding skill to avoid obstacles such as roots, rocks and holes. Some tracks also include man-made technical features such as jumps, bridges, and ditches that are constructed of soil, clay, rocks and timber. Most off-road mountain biking is done on technical terrain because of its availability to people for recreational activities. The tests conducted for the study presented in this paper were done on technical terrain. Advanced terrain is beyond the capabilities of both trail and technical terrains and consists of pedalling over steeps mountain gradients and passing through fast technical downhill sections on rough terrains (Pickering *et al*., 2010; CTC, 2012).

Two factors that have a major influence on the way a mountain cyclist endures a trail are fitness level and handling skills. Experienced mountain cyclists would be confident riding anywhere, even if the trails do not really accommodate mountain biking. The level of skill and fitness more experienced cyclists possess, allow them to attempt mountainous terrain trails with steep gradients and difficult technical skill sections with a reasonable level of comfort (IMBA, 2012).

Heart rate is a way in which the energy efficiency of a cyclist can be measured during testing. A high heart rate relative to a cyclist's maximum heart rate is an indication of a high level of energy exertion. However, heart rate measurements are variable and can easily be affected by surrounding conditions, such as body temperature, stress and anxiety (Davie, 2011). Heart rate data collected during testing in this study were not included as a category classification when creating the TCS, but were used as an indication of effort needed to overcome these sections.

**Trail rating systems**

Risk management is an important issue many bike park owners have to deal with. Allowing cyclists to use trails that are not well maintained and constructed can lead to severe injuries. Trail rating systems may contribute to lowering the risk of injuries through provision of information on the expected difficulty of the specific trail (IMBA, 2012). The International Mountain Bicycling Association (IMBA) is a non-profit association with a mission to create, enhance and preserve safe bike trails for mountain bikers all over the world (IMBA, 2012).

IMBA developed a basic rating system by evaluating at visible characteristics that help users in the planning of trails and trail systems. The rating system is called the Trail Difficulty Rating System (TDRS). It was adapted from the International Trail Marking System used at international ski areas (IMBA, 2012). The system is widely used in trail networks, and is

mostly found in trails that are associated with holiday resorts.

The TDRS is based on four parameters that, when combined, provides a single indication of the trail difficulty as indicated in Table 1. The trail surface parameter is described from hardened, to widely variable and unpredictable. The trail width and grade provide quantifiable indications of these parameters. The TDRS does not constitute a standard and serves only as a basic indication to rate the difficulty of a mountain bike trail. The four parameters consider only the technical challenge of the track and do not take into account trail length and physical exertion from the cyclist. Apart from the trail width and grade, the other parameters are not quantified, and the system also does not provide an indication of the potential experience of the cyclist on the trail in terms of a parameter, such as rider comfort. Current trail ratings systems (IMBA) have no purpose unless the difficulty of each trail are well marked along the trail and also indicated on maps of recreational park trail systems. By ensuring this, cyclists will be able to plan ahead and help them to choose trails that match their level of skill (ASR, 2011).

***TABLE 1*: INTERNATIONAL MOUNTAIN BIKING ASSOCIATION (IMBA) TRAIL RATING SYSTEM** (IMBA, 2012:online)

| **Rating criteria** | Easiest **White circle** | Easy **Green circle** | More difficult **Blue square** | Very difficult **Black diamond** | Extremely difficult **Double black diamond** |
|---|---|---|---|---|---|
| Minimum Trail width | >1800mm | >900mm | >600mm | >300mm | >150mm |
| Trail surface | Hardened or surfaced | Firm and stable | Mostly stable & some variability | Widely variable | Widely variable & unpredictable |
| Maximum trail grade | 10% | <5% | <10% | <15% | <20% |
| Natural obstacles and Technical Trail Features (TTF) | None | Unavoidable obstacles <50mm; Avoidable obstacles may be present; Unavoidable bridges wider than 900mm. | Unavoidable obstacles <200mm; Avoidable obstacles may be present; Unavoidable bridges wider than 600mm; TTFs <600mm high, deck width>height. | Unavoidable obstacles <380mm; Avoidable obstacles may be present; May include loose rocks; Unavoidable bridges wider than 600mm; TTFs <1200mm high, deck width<½height; Short sections may exceed criteria. | Unavoidable obstacles <380mm; Avoidable obstacles may be present; May include loose rocks; Unavoidable bridges wider than 600 mm; TTFs >1200mm high, deck width unpredictable; Many sections may exceed criteria. |

**Vehicle–paver**

A road profile
shows the rou
be used to:

- Monitor the
  (PMS);
- Evaluate th
- Diagnose t
- Study the condition of certain section for research.

Flat open grassland

Flat single track

Flat single track including artificial technical features

Road roughness is the deviation in elevation felt in the vehicle while riding along a certain road, the difference in vertical displacement acts on the wheels causing vibrations. Roughness is expressed i
(Gillespie, 19
moments but a
riding the vert
movements to

Almost every
(IRI) statistic.
roughness tha
suspension movement divided by the distance trav
(Sayers & Karamihas, 1998). The IRI summarises
response and is appropriate when roughness measures relate to:

Uphill smooth gravel jeep track

Uphill technical single track

Downhill smooth gravel jeep track

with units of m/km
that impact vehicle

- Overall vehicle operating cost;
- Overall riding quality;
- Dynamic wheel loads; and
- Overall surface condition.

Typical IRI values for vehicles on roads range between 1 and 20. However, in the application for this paper, the IRI is used as a general indication of riding quality, and it is appreciated that the IRI has originally been developed for cars with their respective dynamics.

For roads, the target is an IRI value as low as possible, however, higher levels of roughness are sought and provides the challenge for mountain biking. Road pavements with an IRI above 8m/km are almost impassable for most vehicles without decreasing their speed significantly. This is the range of riding qualities where mountain bike trails start to provide a decent challenge to the cyclist. The higher the IRI value, the more difficult it becomes and more skill and energy are needed by a mountain bike cyclist to overcome a section.

## EXPERIMENTAL METHODOLOGY

Figure 3, on the next page, represents 7 terrains used for the experiment of this study.

***FIGURE 3*: SEVEN TERRAINS USED FOR THE EXPERIMENT**

**Equipment, terrain and measures**

A Diamond shape Titan Hardtail 29 inches mountain bike with a Deore XT group set, Shimano SL-M590-3 shifters, Draco White 180/180 brakes and a Shimano M522 24-32-42T chain wheel was used in the experiments (Titan Bicycles, 2012). Two X16-1C accelerometers were used to measure the vertical accelerations (GCDC, 2011). A calibrated mountain bike specific Global Positioning System (GPS) was used to record the different grades, elevation changes, speed and cyclist heart rate. The Groenkloof Nature Reserve is a popular area for mountain biking in Pretoria with numerous routes of different technical difficulty. Seven different terrains were selected for testing as shown in Figure 3. Before a test was done the width and length of each section was measured.

Acceleration sensors were mounted on the handle-bar and the seat post of the mountain bike. The handle-bar was chosen because it is the primary position in steering a mountain bike. A large amount of vibration would be damped by the front shock. The second accelerometer was placed on the seat post. Riding comfort and quality is directly related to vibration. If the vibration on the seat is too severe a cyclist would be forced to stand on the pedals which could lead to more physical fatigue.

A Response Type Road Roughness Measurements **(**RTRRM) model, based on the vertical

acceleration response of a mountain bike riding on road roughness calibration sections was developed (Lukas, 2012) to calculate the roughness of the mountain bike trails. The model was calibrated at a cycle speed of 10km/h. Sections were tested one at a time with a standing start 5 m before the start of the section to reach the speed at which data collection was done. Each section was measured three times at 10km/h±1km/h, starting with the heart rate of the cyclist at below 90 beats per minute (BPM).

## DATA COLLECTION

The difficulty of Mountain biking is a function of various parameters. For the purpose of the current study the following parameters were used to analyse the technical challenge of different sections:

- Trail section roughness in terms of IRI;
- Trail width;
- Average and maximum section gradient; and
- Artificial and natural features.

According to IMBA the physical exertion of a cyclist should not be measured to create an index. During the experiment the heart rate of the cyclist was monitored to provide a perspective on the physical exertion that the different types of trail sections have on the cyclist.

A Power Spectral Density (PSD) analysis was performed on the vertical acceleration data to identify the dominant frequencies for each section (Figure 4). The vibration energy that a cyclist absorbs during a section can be determined by calculating the area under a PSD graph. The effective width of a trail will have a contributing factor towards the difficulty of the

section. The narrower the section the more handling skill will be required from a cyclist to keep the bicycle on the trail. Width measurements were taken every 5 m on a section from which the average width and maximum width were determined. The maximum gradient was the steepest part measured on a section that was at least 3m long. The average gradient of the sections is the total vertical displacement over the horizontal length.

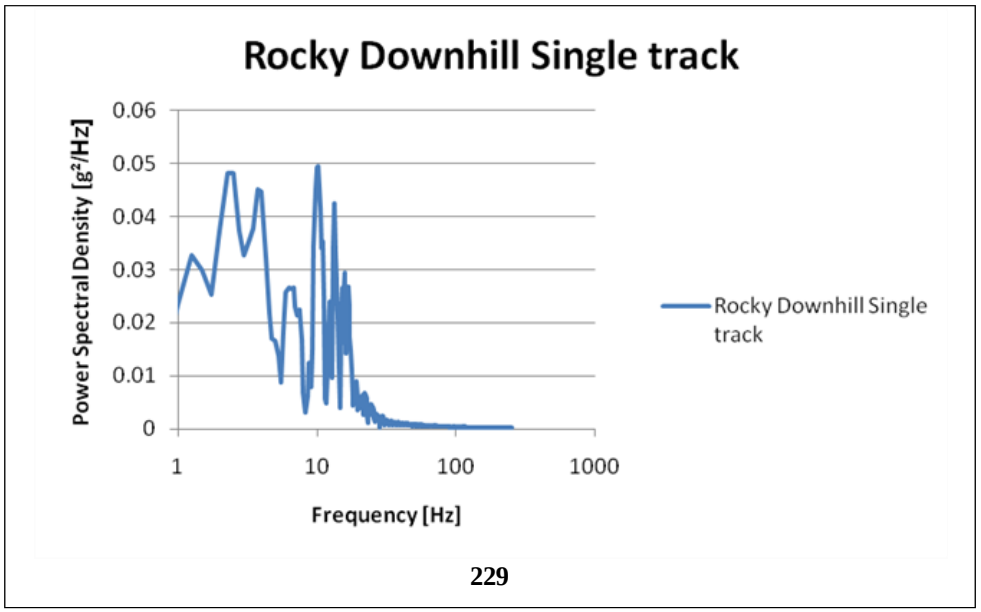

***FIGURE 4*: TYPICAL POWER SPECTRAL DENSITY (PSD) GRAPH FOR A SECTION USED IN THIS STUDY**

Artificial and natural features also contribute to the difficulty of a trail. The effect that features, such as rocks, roots, logs and holes have on a cyclist, will depend on a cyclist's skill. The height of each obstacle was measured from the trail surface up to the highest point. In cases of uneven obstacles the height was measured up to a point where it is the easiest to ride over. In the case of bridges the height above the ground, as well as the width of the bridge were measured. The effect that the artificial and natural features have on a section can be related to the vibration measurements taken over a section. The measurements of unavoidable obstacles, such as rocks, roots, holes and trees are shown in Table 2 (Jeep track trails has two wheel tracks compared to single track trails).

## DATA ANALYSIS

### Trail section analysis

The rocky uphill single trail section had the highest roughness (IRI of 62.3 m/km) and the flat single trail the lowest (IRI of 19.7 m/km). The uphill rocky single track section had the highest obstacle height and throughout the section many loose rocks occurred, thus resulting in the relatively high IRI value.

***TABLE* 2: RIDING QUALITY, WIDTH, MAXIMUM AND AVERAGE GRADIENT AND OBSTACLE HEIGHTS OF TEST SECTIONS AT GROENKLOOF NATURE RESERVE**

| **Different Sections** | **IRI** (m/km) | **Average width** [m] | **Maximum width** [m] | **Maximum grade** [%] | **Average gradient** [%] | **Obstacle height** [m] |
|---|---|---|---|---|---|---|
| Open Grassland | 38.1 | >5 | >5 | 2.0 | 1.0 | <0.04 |
| Flat single track | 19.7 | 0.35 | 0.6 | 3.0 | 2.5 | <0.02 |
| Single track with features | 28.0 | 0.8 | 0.8 | 5.5 | 5.0 | <0.10 |
| Uphill jeep track | 56.5 | 2.4 | 3.0 | 15.0 | 9.7 | <0.15 |
| Uphill rocky single track | 62.3 | 0.5 | 1.5 | 18.0 | 11.4 | <0.30 |
| Downhill jeep track | 46.51 | 3.5 | 4.0 | 12.0 | 9.5 | <0.10 |
| Downhill rocky single track | 52.37 | 0.6 | 1.0 | 12.5 | 12.0 | <0.12 |

The grass section roughness was higher than the flat single track section possibly due to roots of the grass causing small vertical displacements that are picked up by the accelerometers. The higher IRI value of the grass could also be due to the flat single track section being used more often than the grass section resulting in the grass being totally removed and leaving the ground

well compacted and relatively smooth.

It was found that as the height of natural obstacles increases, the IRI value of the section increased (Figure 5). The IRI values could vary from ride to ride, the reason being that the cyclist may on one ride hit a rock on the section causing a larger vertical displacement than the next time when travelling past the rock.

The effective width of each section was measured (Table 2). From these widths it was found that the effect it has on the physical exertion by the cyclist is minor, although it directly affected the level of comfort a cyclist experienced. It was evident that the effective width of a section is mainly influenced by natural and artificial features present. The rocky uphill section has an average width of 500mm and a maximum width of 1.5m but, with a rock of 300mm high, the cyclist will be forced to navigate a line around it. Experienced cyclists may traverse over the rock while inexperienced cyclists will either attempt to ride around the rock or dismount.

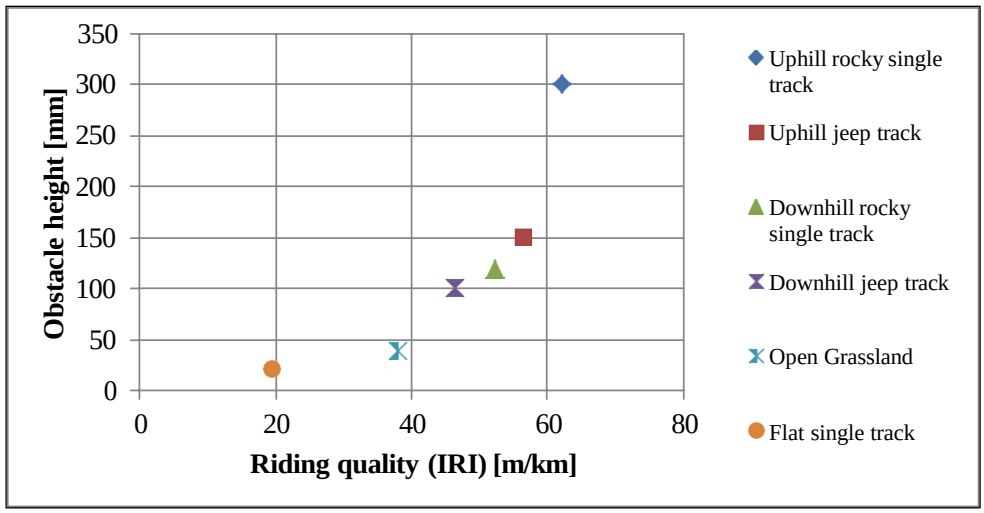


***FIGURE 5*: COMPARISON BETWEEN RIDING QUALITY AND OBSTACLE HEIGHT ON THE SIX TRAIL SECTIONS**

In the case of artificial features the effective trail width is directly related to the width of the artificial feature. The height and width of the feature have an effect on the cyclist. The narrower the section and the higher it protrudes above the ground, the higher the level of handling skills that will be required from a cyclist. A relationship can be drawn between the level of comfort and the width of a trail, namely that the narrower the trail, the lower the level of comfort a cyclist will experience because there is a higher risk for a mistake which could lead to serious injury.

The trail gradient contributes significantly to the physical exertion of a cyclist. The steeper the uphill gradient of a section the more effort was needed to maintain a speed of 10km/h. Roughness also contributed to the difficulty on uphill sections. This effect was best experienced on the two uphill sections. Although the average gradient of both sections was similar, the roughness of the rocky uphill was much higher than the roughness on the uphill jeep track section. This higher roughness caused the cyclist to experience a lower level of comfort as the cyclist had to maintain focus on the pedal stroke to maintain speed while navigating between

large rocks. On the jeep track the roughness was less, increasing the level of comfort and allowing the cyclist to mostly focus on maintaining speed.

On the downhill sections maintaining speed was not a concern. What contributed largely on the downhill section was the flow of turns through a section. The sharper the turn the more skill in braking and turning is expected from the cyclist due to the momentum of the bike going forward. Thus, from the gradient analyses it is clear that the steeper the gradient of the trail the higher level of fitness and bike handling skills will be needed to overcome the gradient.

**Accelerations absorbed due to different roughness**

As the cyclist completes a section, vertical accelerations are absorbed through the seat post and handle-bar. These accelerations can be interpreted as the vibration energy absorbed by the cyclist due to the unevenness of the trail. The different amounts of energy absorption per section are shown in Figure 6. The energy absorbed by the handle-bar and the energy absorbed by the seat post are different from one another on the uphill and downhill sections, but similar on the flat sections. This difference in energy absorption can be explained through simple physics.

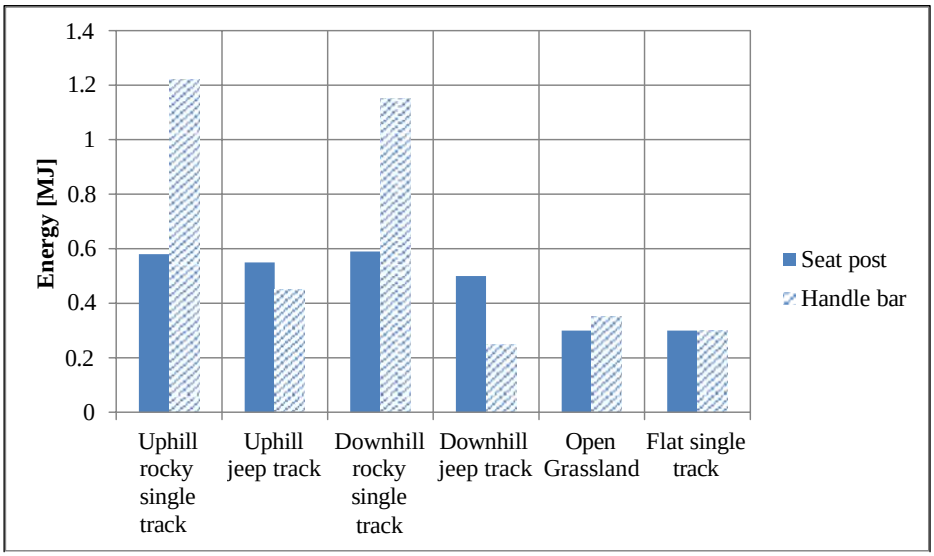


***FIGURE 6*: ENERGY ABSORPTION OF CYCLIST ON THE SIX DIFFERENT TRAIL SECTIONS**

If the cyclist leans back on the uphill sections, the vertical accelerations on the handle-bar will be higher due to the smaller force placed on the handle-bar by the cyclist, leading to relatively high vertical accelerations and higher energy absorption, decreasing the level of comfort a cyclist experience. Rear wheel accelerations will decrease due to the higher mass placed on the rear wheel. This restricts most of the vertical accelerations. The lower energy absorption could also be due to the cyclist being able to have better control of the rear end of the bike by steering the front wheel of the bike over the more difficult obstacles thus leaving the rear wheel to follow over the smoother trail path. On the downhill the effect is opposite, with the angle of the downhill slope forcing the cyclist to lean forward while remaining seated, thus resulting in a higher mass on the front wheel. The lower pressure on the rear wheel causes higher vertical accelerations when travelling over obstacles.

The flat sections' energy absorption at the handle-bar and seat post is similar. This can be seen as a good indication that the cyclist placed equal pressure on the rear and the front wheel of the mountain bike. The flat single track had a very low relative IRI value thus increasing the level of comfort and lower level of vibrations. The grass soft surface increased the rolling

resistance of the tyre that leads to a higher rate of physical exertion. With the grass section's IRI value slightly higher than the flat section, the energy absorbed can be expected to be higher as found. The higher roughness value can also be due to small indentations under the grass surface caused over a period of time. With the roughness on both of the flat sections being low due to few (or no) natural obstacles on the trail, results in a relatively low energy absorption and a high level of comfort experienced by the cyclist on the flat section.

**Heart rate measurements analyses**

Heart rate data were used in this paper as a general indication of the physical exertion of the cyclist during each of the measurements. The data were expressed as a ratio between the average heart rate measured over the section and the resting heart rate of the cyclist. One experienced cyclist was used for all measurements, and the cyclist rested until resting heart rate was attained before repeating measurements at 100 per cent effort for the specific cyclist. The data in Table 3 indicate that the cyclist required the lowest physical effort to ride the downhill jeep track, open grassland and flat single track sections, while the highest physical effort was required for the uphill jeep track.

***TABLE 3*: HEART RATE RATIOS AS INDICATION OF CYCLIST PHYSICAL EXERTION**

| Trail sections | Heart rate ratio |
|---|---|
| Open Grassland | 1.4 |
| Flat single track | 1.4 |
| Uphill jeep track | 2.0 |
| Uphill rocky single track | 1.7 |
| Downhill jeep track | 1.2 |
| Downhill rocky single track | 1.6 |

Additional analysis of the data indicated that the energy absorbed was related to the trail roughness (Figure 7) (roughness data were independently measured using separate bike and sensor), with major increases for trail roughness above 50m/km. Acceleration data from the fork are shown in Figure 7. Due to the fact that the rear wheel was less prone to lift off from the ground its acceleration data were more consistent than when riding a track section multiple times.

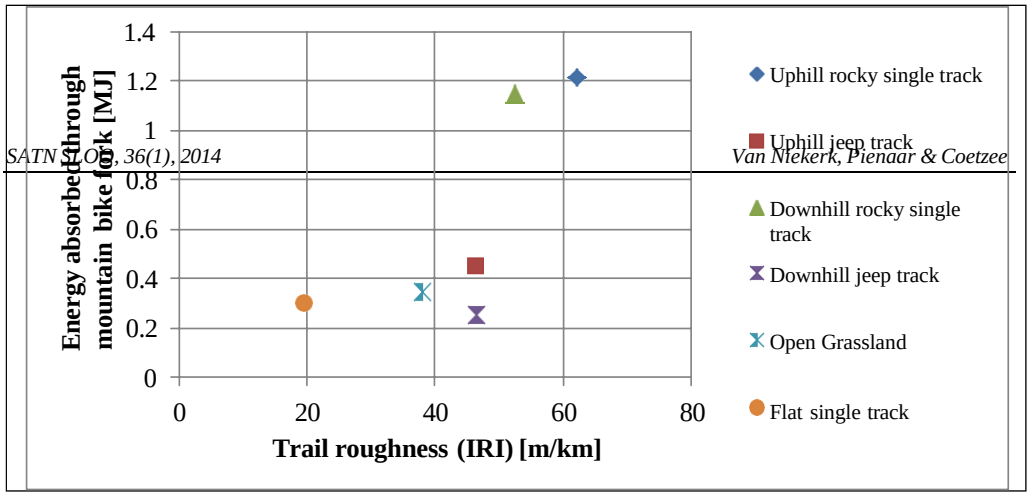


***FIGURE 7*: RELATIONSHIP BETWEEN TRAIL ROUGHNESS AND VIBRATION ENERGY ABSORBED**

## IMPLEMENTATION OF INDEX

It is recommended that based on the results obtained from the study, the Trail Classification System (TCS) shown in Table 4 should be implemented on mountain bike trails as a means of informing mountain bike cyclists of the expected levels of difficulty, comfort and fitness requirements before cyclist start using the trail. It is mainly based on the IMBA system, with the addition of the V-PI principles, such as trail roughness and vertical acceleration data (providing a ride comfort indication), and the heart rate data (providing a fitness requirement indication).

## CONCLUSIONS

Based on the findings and discussion, the following conclusions are drawn:

- Trail roughness defines the IRI value of a section with larger obstacles and more rocky areas causing the relatively higher roughness in the flow line.
- Trail width affects the comfort of a mountain bike cyclist with narrower trails causing lower levels of comfort and requiring higher skill levels.
- Trail gradient is the main contributor to difficulty of a mountain bike trail in terms of physical exertion on the mountain bike cyclist.
- The vibration energy absorbed by a mountain bike cyclist is directly related to the vertical accelerations from both seat post and handle bar caused by the trail roughness.



***TABLE 4*: RECOMMENDED RIDING QUALITY INDEX**

| Trail features | Easy: White | Moderate: Yellow | Difficult: Blue | Ver |
|---|---|---|---|---|
| Trail width | >2000mm | >1000mm | >500mm | |
| Trail surface | Relatively flat, wide roads with well compacted or paved surface. May be loose or muddy | Soft loose surfaces, grass land and muddy at times. Short single track sections with small | Variable surface types. Lots of flowing single track with plenty of rocks, roots and obstacles. | Wide va unpredi Technic track wi obstacle |

| | | | | |
|---|---|---|---|---|
| | at times. | rocks, roots and obstacles. | | overcor required |
| Comfort indication (IRI) | <30m/km | < 45 m/km | < 60 m/km | |
| Average trail gradient | <4% | <8% | <12% | |
| Maximum trail grade | <5% | <10% | <15% | |
| Natural and technical trail features | None | Bridges over challenging technical features. Unavoidable obstacles <50mm. Bridges wider than 1000mm | Technical features present with avoidable routes such as bridges, drops and cambers. Unavoidable obstacles <150mm. Drops <300mm. Artificial features <1000mm high | Unavoi <300m technic gardens unavoi Unavoi <300m Drops > Artifici high |
| Required fitness level | Low. Active lifestyle. | Medium. Regular trail riding. | Seasoned cyclist. Technically competent. | Very ac Technic |

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# MANAGING ENVIRONMENTAL IMPACT OF BOULDERING AS A NICHE OUTDOOR-CLIMBING ACTIVITY

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***ABSTRACT***

*The paper proposes a normative management instrument to help environmental managers in the field of outdoor recreation and conservation limit the impact of sport climbing, bouldering in particular, as an action-sport activity. Evidence of the rising popularity of the bouldering sport and its associated impacts on natural- resource areas is presented. The model is applied to and tested in the Rocklands bouldering area of South Africa to demonstrate its efficacy. The instrument uses 58 test criteria to account for the maintenance of a resource's market appeal and resource sensitivity by capturing these aspects at three spatial scales: the bouldering area as a whole, its sub-fields and the individual boulders. The model should aid conservation authorities, owners of private climbing areas and the organised climbing fraternity to ensure long-term sustainability of the use of climbing resources. The research concludes that the instrument provides the means to manage a natural resource sustainably within local and even international contexts.*

**Key words:** Bouldering; Nature-based tourism; Activity impacts; Management- model design and application; Rocklands bouldering area.

## INTRODUCTION

Bouldering is an outdoor action sport, the conduct of which in natural settings has real and

perceived environmental impacts. The focus in this paper narrows from an international vantage point on the sport to activity in the Rocklands bouldering area in the designated Cederberg Wilderness Area (CWA) of the Western Cape province of South Africa. Globally, demands for outdoor adventure on natural lands increase constantly, hold significant economic value (Kroeger & Manalo, 2007), and challenge existing policy and management structures for systematic knowledge about and understanding of new user groups, their preferences and their demands on the management of public land (Ewert *et al*., 2006).

Bouldering has been around for a long time (Gill, 1969), after originating simultaneously in Europe and the USA (Department of Conservation and Natural Resources, 2008), finding later and slower entry in Central and South America (Farrell & Marion, 2002), Africa and Asia. Participation has grown enormously with hundreds of thousands of participants practicing on every continent, in urban, rural and undeveloped environments (Ness, 2011). A boulderer is only equipped with a chalk bag (containing magnesium carbonate dust), and climbing shoes. Safety and protection are provided by a specially constructed foam laminate 2x1 m bouldering mat or pad (crash pad). A boulderer climbs a specific problem (series of moves), preferably from a sit-start position with the pad absorbing the shock of any fall. The total height of a route averages 2 to 4 m (MCSA, 2005).

Bouldering impacts range from the physical to the social (MCSA, 2005; Attarian & Keith, 2008; Vaske & Donelly, 2008). Bouldering pads damage plants when draped over vegetation and rock-hugging trees have their branches removed to accommodate new problems. Although it is assumed that the chalk used in bouldering is washed away by the next rain (MCSA, 2005), its effect on cliff environments (lichens and other vegetation) is unclear (Cater *et al*., 2008). Rock art is known to be damaged by climbing activity. A number of sources (The Access Fund, 2001; Attarian, 2002; Cole, 2004b; Frauman *et al*., 2010), summarise and expand on the potential impacts of bouldering and the responses by managers to these. Pristine wilderness does not persist around bouldering sites (Ness, 2011), and the sport is not static in time and space. New bouldering routes are constantly being explored and developed. The impacts from bouldering on these natural areas have not received sufficient attention in the management literature (Cater *et al*., 2008), although they have recently become the focus of more detailed analysis (Pickering & Hill, 2007; Porucznik, 2009).

Trampling is a universal problem on the outdoor recreation and conservation interface (Ross, 2006; Pickering & Hill, 2007; Zhong *et al*., 2011). The biodiverse Fynbos Biome is especially susceptible in the Cederberg. The Mountain Club of South Africa (MCSA) (2005:11), claims many climbing routes and boulders are "located above rock platforms and there is no or extremely limited vegetation loss in these areas". Evidence of trampling has, however, compelled CapeNature to begin systematic monitoring and remedial measures there (Hanekom & Davids, 2011). South Africa has become a premier destination for local and international boulderers, since it boasts one of the five top internationally ranked sites at Rocklands. The Internet and reputable glossy publications (Lourens & Igesund, 2010; Noy, 2010; Maddison, 2011), popularise its fame and attraction as an outdoor activity centre and bouldering destination. At Rocklands an estimated one-third only of the climbers obtained climbing permits (Hanekom & Davids, 2011), and at the De Pakhuys control gate the number of entrants totalled over 600 during the recent five-month climbing season, which is a continuation of a trend of annual doubling in numbers (Kruger, 2011). It responds to the call for research to give strategic attention to the natural resources crucial for sustainable ecotourism (Crispin &

Wickham, 2010), and visitor-management strategies by formulating indicators and standards for ensuring quality visitor experience (Adamovics *et al*., 2003; Manning *et al*., 2005).

## PURPOSE

This paper addresses the Monz and Leung (2006) challenge to parks management to maintain natural resources and allow an unconfined visitor experience by monitoring trends in visitor use and resource condition, through collecting, processing and monitoring information.

## METHODOLOGY

### Data sources and fieldwork

Cole and Wright (2003) record a paucity of data on US wilderness visitors and their recreational impacts, and they emphasise the great value of the various types of baseline data

obtained for this study. An extensive Internet search confirmed the high standing of the Rocklands area in the local and international bouldering communities. To complement literature surveys, one author (Joubert) spent 4 months doing participatory observation while bouldering at various locations in the Western Cape, particularly in the Cederberg Rocklands area. He gained intimate knowledge of the life worlds of climbers and the factors determining the market appeal of bouldering locations. Primary empirical information on the location of specific boulder problems was acquired, as well as an understanding of management issues. Boulder-morphological data used for evaluating problem locations were sourced from Loskott (2005) and Bouldering SA (2006), as well as SACIN (2006) for the various boulder fields. Empirical observation and participation provided unique supplementary data.

Semi-structured personal interviews with the staff of management agencies and the climbers informed the construction of the Bouldering Market Appeal and Sensitivity Gauge (BMASG). The prototype instrument was e-mailed to select members of the MCSA for deliberation and their suggestions. After refinement the BMASG was applied to 523 individual problems located in 16 of 24 demarcated boulder fields in the Rocklands area to assess the robustness and practicality of the model (Joubert, 2006). In-depth interviews with officials of CWA (nature conservator and tourism coordinator) at CapeNature in 2011 yielded management information. The owner of De Pakhuys farm, on which most of the eastern sector's boulder fields are located, and operator of Camp Sallie, was interviewed and a 1 year registration data set for analysis.

### Spatial framework of bouldering activity

Studying the impacts and management of bouldering activity and visitation on outdoor resources (Bateman *et al*., 2003; Cole & Monz, 2004), requires special attention to the spatial dimension of activity zones (Porucznik, 2009). The study of bouldering as adventure-sport tourism is best approached using the spatial framework for Rocklands graphically defined in Figure 1.

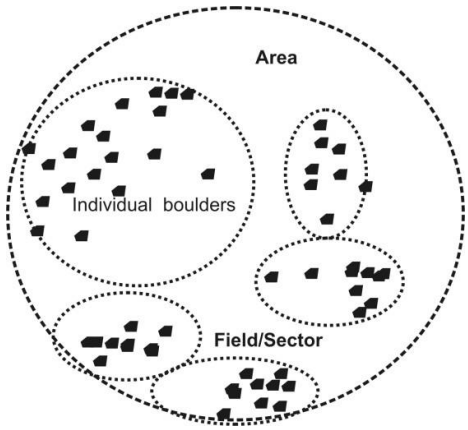



***FIGURE 1*: GENERIC EMBEDDED RESOLUTION OF BOULDERING MANAGEMENT UNITS**

The bouldering fraternity distinguish 24 separate fields in designated northern, eastern and 2 southern sectors. The southern sectors are located in the CWA managed by CapeNature, the eastern section is on private farmlands (De Pakhuys and two neighbours), and the northern sector is on mixed private and CWA land. The distinction between continuous fields is often problematic and single boulders or small rock formations may have only 1 or numerous individual problems on them. For instance, on the Dihedral Boulders, more than 70 problems have been isolated (De Pakhuys Dihedral Bouldering, 2011; Janata, n.d.). Not all boulders are this rich, but richness and hence popularity are enhanced by the variety and number of problems in close proximity.

This spatial subdivision allows permit or gated restriction to individual boulders or fields in an area, either to restrict or encourage access and to allow remedial actions or rest periods for stressed areas. Boulder problems are generally grouped into 7 morphological variants: arête, dyno, face, high-ball, roof, slab and traverse (see Appendix A for explanations). The dominant variant determines the problem's variant status. Roof, face and slab allude to the structure of the problem and traverse and dyno to the nature of the movements required to complete the problem. High-ball refers to the possible height of a climber's fall. Other variants exist, but are subsumed under these 7.

## RESULTS

In this section a discussion of the theoretical requirements for and typology of the model precedes an exposition of the design particulars of the model and concludes by reporting the results of the model's application to the Rocklands boulder area.

### Normative bouldering-management model

The tenets of the model are sustainable management of an outdoor activity resource through participant partnership; evaluation of the appeal to the tourism market; and the resilience of a resource underutilisation. Accordingly, a normative management model must account for resource commodification, product development, product-value assessment, maintenance

sustainability, education of participants and managers, and aiding of partnership formation.

Bouldering assets comprise individual boulders, their problems and the pathways providing access to them. Problem concentrations at meso-scale and macro-scale increase boulders' commodity value as ecotourism resources (Johnston & Edwards, 1994). Commodification is the process by which objects and activities become evaluated primarily for their exchange value in trade (Cohen, 1988). Bouldering assets are tacitly commodified since the natural environment is not altered by the act of climbing, merely used interactively. The activity creates value by generating a sport-cultural heritage via the human–nature interactions packaged for tourists within the paradigm of new adventure sports that do not resist authentic touristification. Climber tourists visit bouldering areas, such as Rocklands, for extended periods (MCSA, 2005), solely to participate in this outdoor activity.

The development[1] of bouldering resources for tourism usually lacks economic motive. Natural heritage in the form of small rock formations and natural boulders is the resource for the creation of a sport-cultural heritage by climbing and holds steady, long-term income value (MCSA, 2005; Kruger, 2011), if used and managed sustainably. Many landowners in and managers of regions rich in bouldering resources in the Western Cape, where favourable geological structures occur in the sandstones of the Cape Supergroup, have had little exposure to bouldering activities. Wurz and Van der Merwe (2004:10) recognise that "… as is the case in any resource-consuming industry, the maintenance of resource integrity is paramount in ensuring the sustainable use of that resource for posterity".

The integrity of bouldering resources alludes to impacts on the boulders and their natural, cultural and social environments. The *natural* component refers to the impact on ecological processes, biological diversity and the rock formations; the *cultural* component relates to impacts on tangible cultural heritage such as archaeological artefacts; and the *social* component concerns relationships between boulderers, local communities and land managers. The use of a principle-based notion of sustainability is more holistic and concrete than the 3-tier triple bottom line (environmental, social and economic) model of sustainability. These principles are embedded in the BMASG criteria which focus on the economic and environmental pillars of sustainability and to a lesser extent the social or community dimension due to its relatively isolated natural location. Yet, understanding the social component of bouldering is vital to managers and developers (Frauman *et al*., 2010), for assessing the value of the resource and marketing it effectively.

Wilderness and areas of world heritage are being targeted worldwide for ecotourism and, crucially, remaining mountain wilderness in South Africa is poorly protected (Shroyer & Blignaut, 2001). Nature remains undervalued in the absence of valid knowledge about authentic natural and cultural environments, although a range of economic valuation techniques do exist (Grijalva & Berrens, 2003). Consequently, participation by and education of the climbing community, landowners and managers, constitute the foundation for application of the sustainable management principles embedded in the BMASG. It is essential to understand and direct tourist behaviour where cultural heritage is involved. Through education, the concept of minimal impact is implied and thus assessment of the sensitivity of a specific location must precede development. The BMASG has the task to educate all participants, boulderers and managers alike, about the bouldering phenomenon.

The impacts of climbing activities increase in proportion to the numbers of climbers

participating; hence limits on user numbers substantially minimise the impacts of the activities. Nevertheless, the most successful approach to managing bouldering sustainably is by building a strong partnership between local climbing organisations and land managers. The climbing community supports environmental stewardship to maintain a sustainable climbing experience where ecologically, economically and ethically responsible destination managers, stakeholders and tourists practice appropriate planning, monitoring, evaluation,

[1] Development refers to a boulderer (opener) or team officially opening a new problem, boulder, field or area by climbing where no previous climbing has been done, documenting particulars and introducing it to the climbing fraternity, probably after clearance with owners or management.

and management of nature-based tourism or ecotourism (Deng *et al*., 2002). The BMASG mechanism is geared to facilitate efforts to achieve this sustainability in the sport of bouldering.

**Bouldering Market Appeal and Sensitivity Gauge (BMASG)**

The BMASG is a management instrument which incorporates the principles established above. The following discussion first unravels the technicalities of this normative approach and then applies the relevant criteria sets to each spatial bouldering domain.

***Normative approach***

A successful resource-management instrument should establish standards to realise management objectives. Science contributes to discovering appropriate normative standards for visitor experiences and levels of resource impact. Managers require normative data to develop evaluative standards for impact management (McDonald, 1996), that is a domain beyond the reach of science, but in the realm of management (Cole, 2004a). Here an effort is made from the angle of science.

The search for norms in social outdoor behaviour (Donnelly *et al.*, 2000), has been more rigorously pursued than for the physical norms used. The instrument has to fit into a wilderness-management framework (Farrell & Marion, 2002), or environmental management system (EMS), as a performance-monitoring tool (Moore *et al*., 2003). The BMASG is designed for use by a local management agency (CapeNature), much like EMSs have become established in local authorities elsewhere as less formal, locally-adapted regulative and normative instruments (Emilsson & Hjelm, 2004; 2005).

The gauge is designed to systematically evaluate bouldering locations on an asset-by-asset basis regarding 2 dimensions: their market appeal for boulderers and their ecological resilience to bouldering use at "the convergence of tourism and recreation in an adventure setting" (Pomfret, 2006:114). Assets are evaluated by measurable criteria on 3 scale units, namely individual boulder problem, boulder field and boulder area. The instrument approaches the evaluation challenge from an intimate perspective of bouldering as an activity, rather than just an impact-assessment (Porucznik, 2009). Market appeal to visitors is paramount in the tourism industry, but for conservation management the sensitivity and authenticity of the resource are fundamental. Climbers derive value from the total bouldering experience, which can be significantly diminished by a degraded environment, leading to the loss of its asset-market value (MCSA, 2005).

The BMASG is designed to determine the level of management needed, should be demanded, or be imposed on bouldering locations. Whereas management normally targets individual fine-scale boulder problems, staging areas and access trails, successful marketing demands a coarser resolution viable at the area-scale of regional marketing strategies. Marketing single boulder problems is inefficient, rather an area packaged with concentrations of numerous sets of boulder fields and a multitude of problems. The instrument encapsulates these requirements in 30 significant, purposeful, measurable, readily determinable and non- technical criteria applicable at the spatial and temporal scales at which visitor activities (and their effects) occur (Hadwen *et al*., 2008).

The grading principle of Wurz and Van der Merwe (2004) was adapted for simplicity of use, intuitive understanding, uniform application and a wider adoption in rapid-survey methods (Porucznik, 2009). It recognises the concept of variation in the prevalence, importance, and stability of normative standards at different social or management contexts (Vaske *et al*., 1993; Kuentzel *et al*., 2008). An uncomplicated 4-value scoring range (0=None, 1=Low, 2=Moderate, 3=High) is applied to criteria according to the anticipated degree of vulnerability-robustness and experience rating.

The rating principle is unambiguous, thus the higher the rating score, the higher the marketability, significance and vulnerability. Values also measure and reflect management obligation, hence the higher the score, the more obligatory and stricter the management measures imposed. The rating system integrates the criterion values to produce a specific index reflecting sensitivity and marketability for each of the 3 spatial-resolution variants. Each indicator set is completed with an indexed indicator of mean scores for that subset to consolidate the overall score set. This meets the practical requirement of limiting monetary cost, saving staff time and providing management with an uncomplicated measurement protocol, which is a new approach to a set of importance-performance indicators (Newman *et al*., 2001; Monz & Leung, 2006).

***Criteria for individual boulder problems***

These criteria evaluate the smallest or micro-scale units according to market appeal and sensitivity to damage. The following expositions of the Bouldering Market Appeal and Sensitivity Gauge (BMASG), patterned on the formulations in Appendix A, are necessarily technical and use the climbing fraternity's terminology.

***Criteria for boulder market-appeal***

Criteria for boulder market appeal constitutes rock quality, fall danger (Beedie & Hudson, 2003), and nature of boulder problems (Hanley & Wright, 2003). Nature of boulder problems constitutes the reputation value of the boulder problems, aesthetics of a boulder-problem line, problem grade, number of possible crux sequences of similar grade, degree of eliminate and ease of access (Hanley & Wright, 2003). Criteria for boulder sensitivity agree with those of Porucznik (2009) for evaluating climbing impacts. They take into account the presence of archaeological sites, damage to problems and damage to staging areas (MCSA, 2005; The Access Fund, 2006).

***Boulder-field criteria***

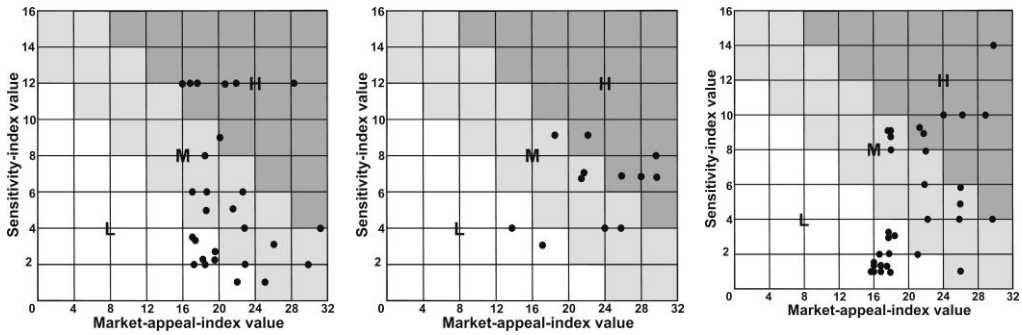
Examples of boulder-impact evaluation (Hanley & Wright, 2003) (boulder-field criteria), have

been performed at field resolution or even at the coarser bouldering area resolution. Criteria for the meso-scale boulder-field unit are subdivided according to market appeal and sensitivity. The criteria represent aggregate and synoptic measures of characteristics deemed to guide management at this coarser spatial resolution. Criteria for boulder-field market appeal include the index value for boulder-problem attraction, boulder-problem component and spatial component while the criteria for boulder-field sensitivity include an ecological and cultural-sensitivity, as well as a field management component.

At macro-scale the bouldering area is evaluated on aggregate market appeal and sensitivity values derived from the nested micro-scale (boulder) and meso-scale (field) criteria measurements. This integrates the social and resource indicators essential for meeting management mandates to protect experiential and resource conditions (Newman *et al*., 2001). The boulder-area criteria constitute the criteria for boulder-area market appeal (index value of boulder-field attraction, spatial-area and bouldering components) and boulder-area sensitivity criteria (Vaske & Donnely, 2002; Wurz & Van der Merwe, 2004).

**Results of the application to Rocklands**

The BMASG index values are quantitative indicators of bouldering assets on a management-marketing continuum. Plotting the scores of individual boulder problems on axes for market appeal and sensitivity in a two-dimensional diagram, demarcates adjustable high (H), medium (M) or low (L) management-need segments and problems designated according to their plotted locations (Figure 2). Diagrams for fields reflect the need for management at field level, thus integrating sensitivity and market-appeal indicators to register management requirements, while recognising that bouldering might not be appropriate in all areas (The Access Fund, 2006), and that bouldering impacts increase in gravity with increasing climber numbers (MCSA, 2005). The reach of the 3 management segments can be adjusted according to management-agency policy mandate to control bouldering impacts. The maximum index values for sensitivity and market appeal in these diagrams were obtained from Rocklands applications. Figure 2 demonstrates applications in 3 fields being 1 from each recognised bouldering sector (an eastern and 2 southern sectors).




a. Dihedral Boulders (Field 14) b. Ceder Rouge (Field 10) c. Riverside (Field 2)

***FIGURE 2*: BMASG APPLICATION PLOTS FOR INDIVIDUAL BOULDERS IN THREE REPRESENTATIVE BOULDERING FIELDS IN ROCKLANDS BOULDERING AREA**

Examples demonstrate sufficient variance in plot patterns and hence differences in management requirements for fields and individual boulders. The aggregated meso-scale

bouldering-field criteria were plotted in Figure 3 using BMASG index scores for 16 of the fields.

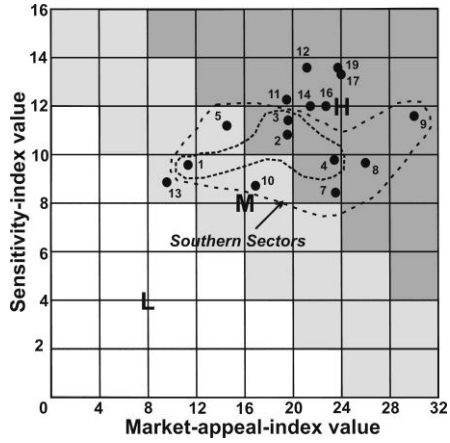



***FIGURE 3*: BMASG PLOTS OF MANAGEMENT NEED FOR BOULDERING FIELDS**

The plotted results show a concentration of fields in the high-management demand section of the diagram, with 12 fields flagged for such attention, 4 at medium level and none in the low-management category. It is significant that fields in the 2 southern sectors congregate in the relatively lower sensitivity and market-appeal section of the continuum, whereas the eastern sector's fields, with the exception of field 13, rate higher on both axes. This alignment is significant from a management perspective because the southern sectors are managed by CapeNature (public authority), while the eastern sector is under private ownership, where commercial exploitation of bouldering potential is more keenly driven. The plot pattern shows sensitivity and market appeal largely balanced in most fields, which is indicative of model design and calibration of index criteria that facilitate objective judgement.

The results show that the instrument and its application may be overly sensitive, perhaps justifiably so in this highly rated conservancy and wilderness area. Moreover, by design the evaluators did not represent a specific user-interest group hence recalibration under operational circumstances is likely. The model should reflect the joint management preferences and aims to encompass the local user community consisting of landowners, land managers, local authorities, local communities and the bouldering fraternity and to adjust to the needs of each unique bouldering area.

## DISCUSSION: BOULDERING-RESOURCE MANAGEMENT IN THE CEDERBERG

Several implications flow from the research outcomes. Bouldering is confirmed as a real-world issue with increasing impact intensities and extent worldwide that is insufficiently recognised in official policy and management strategies, especially in South Africa. Though Shroyer and Blignaut (2001) asserted that developments and poor management practices on private and government land were rife in South African mountain areas, and that mountain wilderness was shrinking, they made no reference to bouldering as an impacting outdoor activity. Even the comprehensive management plan compiled for the Cederberg (Western

CapeNature Conservation Board, 2002), ignored the boulderer as a valuable niche-outdoor recreationist (Pomfret, 2006; Kruger, 2011).

The BMASG seamlessly slots into the broad management suite required to address bouldering as a generator of environmental problems. The model, its constituent criteria, application methodology and results are the tangible legacy of the research and it should find application and have an effect on eight aspects of regional natural-resource management.

In its narrower application context the BMASG has the following outcomes:

- BMASG builds knowledge as an educational tool among boulderers as outdoor-climbing recreationists. The instrument is an educational and outreach tool for promoting low-impact use (Attarian & Keith, 2008), and identifying the needs for educational and directive signage called for by the Cederberg mountaineering plan (MCSA, 2005).
- BMASG raises inter-group awareness among all parties involved in or affected by outdoor-climbing recreation as a regional activity, primarily boulderers, community members and land managers. The MCSA management plan calls for measures that ensure a good recreational experience for climbers (MCSA, 2005), but lacks insight into development potential and management and ignores private land developments, as well as international bouldering tourists oblivious of sustainable-development practices. The BMASG is cognizant of common climber and tourism motives (Pomfret, 2006), rooted in escapism from everyday environments, routines and responsibilities.
- BMASG builds an understanding of boulderers as outdoor recreationists and reaches boulderers on e-platforms. The instrument's electronic format and its repository of evaluation information ensures that young boulderers with access to Internet sites devoted to their activity can be reached to support educational and outreach programmes in popular bouldering locations where initiatives are often in short supply (Pomfret, 2006; Attarian & Keith, 2008).
- BMASG formalises a management tool for gathering impact data systematically, monitoring recreational use and flagging application requirements for management measures. Since climbing impacts increase with increased climber numbers, the experiential quality of routes and ease of access that determine usage patterns of areas can be recorded as carrying-capacity data from the BMASG. Lack of data is a major hindrance to local planning (MCSA, 2005), that prohibits the monitoring and controlling of climber numbers permitted to use specific areas.

In its broad application context the BMASG performs several functions, namely:

- BMASG reconciles and integrates considerations of regional planning and the tourism and conservation sectors. The MCSA management plan specifically aims to minimise climbing impacts in the Cederberg, while maximising the benefits and ensuring a good recreational user experience (MCSA, 2005), yet it lacks foresight into regional development potential and management.
- BMASG facilitates monitoring of bouldering-activity impacts, regional tourism industry growth and development, and harvesting economic benefits and income generation. Understanding and managing bouldering as a unique form of outdoor recreation prevent

conflict with other resource values (The Access Fund, 2006), vital for successful planning. A plethora of bouldering-related issues requiring management are covered in existing international planning guidelines (National Park Service, 2002; The Access Fund [Boulder project in Department of Conservation and Natural Resources], 2006). Local and international actions, behavioural measures and environmental concerns are well known (MCSA, 2005; Cater *et al*., 2008), but management should adopt, what Parkin (n.d.) terms, Minimal Impact (MI) as a code of practice. The BMASG can be a pivotal instrument in engineering this adoption.

- BMASG structures planning and management responses or actions from land managers, landowners and authorities to target specific remedial rules. Current management plans for the Western Cape mountains, embrace coordination frameworks, like zoning and sustainable use focus on direct and indirect benefits, but they predate the Rocklands development, which commenced in 1996. Management elsewhere relies on access control by creating so-called long-walk-in policies (Hanley *et al*., 2002; 2003; Hanley & Wright 2003), but the denser path networks typical of bouldering require a higher level of management and they need to be more clearly demarcated; recommendations to which CapeNature has not yet responded. The MCSA management plan assigns responsibility for monitoring new boulder routes through an internal MCSA committee procedure (MCSA, 2005), but there is no existing basis for objective evaluation and approval, hence no systematic basis for approval, nor any criteria or requirements for applications for new routes. The BMASG provides these systematic, benchmarked process controls, so its use could be made compulsory in the application process with its scores used as conditions of approval as set in the MCSA (2005) plan. In time, it can be amended by the user fraternity in partnership with management.
- BMASG provides the interface where all involved parties raise concerns and see them acted on. It can be instrumental in building and maintaining management stewardship and partnerships essential for best practice in landscape-resource management (Western CapeNature Conservation Board, 2002). Partnerships cannot be realised without management collaborations, which address and validate the concerns of all stakeholders (Ewert *et al*., 2006). To CapeNature and the MCSA, functioning as a national federal body with solid national and international linkages (Schoon *et al*., 2001), adoption of the BMASG could be instrumental in realising their stated goals for bouldering as a variant form of climbing that is glaringly absent from the focus of both institutions.

## CONCLUSIONS AND RECOMMENDATIONS

The BMASG instrument is new and innovative, but has certain shortcomings, of which the absence of clear benchmarking on criterion scores is one. Since collaborative agreement among scientists, management and the user community is paramount (Cole, 2004a), this element has to be improved by refining value judgments and standards applied. As part of the management decision-making frameworks to monitor site conditions, assessing management outcomes and increasing zoning efficiency to protect remote or pristine areas, the instrument would enhance managers' ability to assess, manage and minimise visitor impacts and establish the type of recommended management framework (Farrell & Marion, 2002), that allows participation by the public and members of expert panels. This outreach and participative aspect of management plans must embrace the climbing community through

active involvement and documentation of impacts to obtain the support of climbers (Attarian & Keith, 2008). Understanding the social component of bouldering practices and preferences (Frauman *et al*., 2010), and valid measurement of boulderers' perceptions of and responses to policy change, call for thorough investigation (Adamovicz *et al*., 2003; Hadwen *et al*., 2008). The compatibility of bouldering with other types of land use (Attarian & Keith, 2008), must be exploited without ignoring potential conflicts (Hammitt & Schneider, 2000), and management practices and regulations aimed at conserving the resource boulderers depend on and favour (Nelb & Schuster, 2007), must be employed.

Finally, the spatial approach to analysing, comprehending and addressing the impacts of bouldering offers an efficient management solution. While concurring with the recommendation of Cater *et al*. (2008), for increased and intensified site monitoring and proactive development of site-specific management plans in consultation with climbing groups, we propose a stricter and technically-structured approach. A hierarchical spatial focus from the bouldering area as the overall management unit within which are nested measures for sectors, fields and even individual boulders is hereby recommended. This would allow for frequent monitoring of cumulative damage (Zhong *et al*., 2011), although initial management costs will increase (Attarian, 2002).

There is good reason to urge initial investment in a spatial geographical information system (GIS) database. In the Rocklands case, Noy (2010) laid the analogue map foundation for an operational tourism-cum-bouldering-activity platform for planning and information sharing. Capturing these in GIS produces a database of variable scale and 3D-embedment for the resolution of area, sector, field and boulder problems. The existing CapeNature GIS database could incorporate this information set to systematically plan and implement the MCSA's (2005) suite of monitoring requirements, including climber numbers (continuous), pathways (annually), sport-climbing and bouldering areas (six-monthly, fixed-point photography and rapid survey of vegetation). Fine-scale spatial monitoring is required since visitor impacts show spatial response patterns that must be regulated and managed (Cole & Monz, 2004). It helps management agencies to understand the extent of the resource, to monitor impacts ,and to model various management scenarios (Bateman *et al*., 2003; Gorman *et al*., 2008), as well as encouraging integrative analysis (Newman *et al*., 2001).

Nevertheless, management should guard against applying measures that mitigate against place making – the lived experience of an environment or spatial location – especially since boulderers typically prefer to have the boulders they climb located outside the constricting reach of proclaimed wilderness areas (the politics of place), because the climb, more than the environmental setting, interests them (Ness, 2011). Future research should provide greater clarity to the current grasp of the exceptional life-world of boulderers.

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## APPENDIX A: BOULDERING MARKET APPEAL AND SENSITIVITY GAUGE (BMASG)

**CRITERIA FOR INDIVIDUAL BOULDER PROBLEMS**

| ***A. MARKET APPEAL*** | ***EXPERIENCE RATING* (*Score value)*** | | |
|---|---|---|---|
| | **None (0)** | **Low (1)** | **Medium (2)** |
| *ROCK QUALITY* | | | |
| 1. Grain cohesion | No cohesion, unfit for bouldering | Low cohesion, handholds, sandy or loose | Medium cohesion, some footholc sandy or loos |
| 2. Grain size | Jagged and coarse (cause instant bleeding if climbed) | Coarse, but can be climbed, not skin-friendly | Some holds coarse, mostly fine, relatively skin-friendly |
| *FALL DANGER* | | | |
| 3. Result of potential fall (height) | Possible death | Bone-breaking | Light injury |
| 4. Result of base gradient (steepness) | Possible death | Bone-breaking | Light injury |
| 5. Result of base cover (hardness) | Unpaddable | >5 crash pads | 3-5 crash pads |
| *NATURE OF BOULDER PROBLEM* | | | |
| 6. Reputation value | None | Local | National |
| 7. Aesthetics of line | No appeal | Low appeal | Medium appeal |
| 8. Grade (Font grade) | <6a | 6a-6c+ | 7a-7c+ |
| 9. Number of possible crux sequences of similar grade | >3 | 3 | 2 |
| 10. Degree of eliminate | Problem described and of fully eliminate nature | Holds off due to eliminate nature | Starting holds or top-out describ |
| 11. Ease of access | Inaccessible | Hard scramble, long walk-in | Moderate walk-in, easy scramble |
| 12. Index of individual boulder problem attraction value | ≤8 | 9-17 | 18-25 |

| ***B. DAMAGE SENSITIVITY*** | ***VULNERABILITY/ROBUSTNESS RATING* (*Score val*** | | | |
|---|---|---|---|---|
| | **None (0)** | **Low (1)** | **Medium (2)** | |
| 1. Archaeological artefacts present | Absent | | | |
| *PROBLEM DAMAGE* | | | | |

| | | | | |
|---|---|---|---|---|
| 2. Risk of human damage to structure of problem | None | One damage type | Two damage types | F |
| 3. Vulnerability to physical damage by nature | None | Low | Medium | |
| 4. Current level of damage | Pristine | Limited, reparable | Some reparable/irreparable | |
| *STAGING AREA DAMAGE* | | | | |
| 5. Risk of erosion or disturbance of material | None | Low | Medium | |
| 6. Risk of vegetation damage | None | Low | Medium | |
| 7. Current level of damage | Original pristine condition | Limited, reparable | Some reparable, some irreparable | |
| 8. Index of individual boulder problem sensitivity | ≤4 | 5-9 | 10-13 | |

**CRITERIA FOR BOULDERING FIELDS OR SECTORS**

| ***A. MARKET APPEAL*** | | ***EXPERIENCE RATING* (*Score value)*** | | |
|---|---|---|---|---|
| | **None (0)** | **Low (1)** | **Medium (2)** | |
| *INDEX VALUE: ATTRACTION OF INDIVIDUAL BOULDER PROBLEMS* | | | | |
| 1. Number with high attraction index value | None | ≤9 | 10-20 | |
| 2. Number with medium attraction index value | None | ≤20 | 21-40 | |
| *BOULDER PROBLEM COMPONENT* | | | | |
| 3. Number of problems | 1- 20 | 21- 40 | 41-60 | |
| 4. Boulder problem variance | None | 1-2 problem styles | 3-6 problem styles | |
| 5. Range of boulder problem grades | 1 Font number grade | 2 Font number grades | All Font number grades | |
| *SPATIAL COMPONENT* | | | | |
| 6. Distance of sector to next field | >20 km | 20-10 km | 9-1 km | |
| 7. Average boulder size (height) | ≤2m | 2-3m | 3-4m | |
| 8. Access to boulder field | Inaccessible or no bouldering allowed | Access with guides only | Some restrictions, permit system or number limitation | |
| 9. Field problem dispersal or concentration | Widely dispersed | Some concentration | Medium concentration | |
| 10. Average slope of field terrain (ease of movement) | >45° | 31-45° | 16-30° | |
| 11. Index of field attraction value | ≤7 | 8-15 | 16-23 | |
| ***B. DAMAGE SENSITIVITY*** | | ***VULNERABILITY/ROBUSTNESS RATING* (*Score valu*** | | |
| | **None (0)** | **Low (1)** | **Medium (2)** | |
| *ECOLOGICAL AND CULTURAL SENSITIVITY COMPONENT* | | | | |
| 1. Level of formalisation and stabilisation of access paths | All paths formalised and stabilised with mini trail requirements (trail plan) | Shortcuts and redundant path systems present | Only kern system – no formalised and stabilised paths (no trail plan) | N d |
| 2. Index of individual boulder problem sensitivity | <25% of problems with high sensitivity value | 25-50% of problems with high sensitivity value | 50-75% of problems with high sensitivity value | > v |
| 3. Presence of red-flagged individual boulders | None | Located outside current boulder-fields development | Located in developed boulder-fields or sector | I |
| 4. Vegetation sensitivity | No critically endangered or sensitive species | Sensitive species | Critically endangered species | C |
| *MANAGEMENT COMPONENT* | | | | |
| 5. Management level | Formal management policy with enforcement and climbing-community support | Formal management policy without enforcement or climbing-community support | Informal management policy without enforcement & climbing-community support | |

| | | | |
|---|---|---|---|
| 6. Service provision | Full suite (guides, guide-books, ablution facilities) | Guidebooks or brochures and ablution facilities | Only guidebooks or ablution facilities |
| 7. Access restriction | Access with guide, permit and limited numbers | Permit system with limited numbers | Permit system without limited numbers or limit not enforced |
| 8. Structure of management | Climbing-organisation responsible for management; local representative | Private or public management with limited climbing-organisation involvement | Private or public management without climbing-organisation involvement |
| 9. Visitor-number monitoring | Full suite of formal monitoring (trail-use count, parking-lot inventories, permit system) | Formal monitoring measures | Informal or poor monitoring and recording |
| 10. Involvement of climbing community | Climbing organisation as formal management agency | Formal partnership with management agency | Informal partnership with management agency |
| 11. Index of field sensitivity values | ≤7 | 8-15 | 16-25 |

**CRITERIA FOR BOULDERING AREA**

| ***C. MARKET APPEAL*** | ***EXPERIENCE RATING* (*Score value)*** | | | |
|---|---|---|---|---|
| | **None (0)** | **Low (1)** | **Medium (2)** | |
| *INDEX VALUE: FIELD OR SECTOR ATTRACTION* | | | | |
| 1. Number of bouldering fields with high attraction index value | None | 1 | 2-3 | |
| 2. Number of bouldering fields with medium attraction index value | None | ≤3 | 3-10 | |
| *SPATIAL AREA COMPONENT* | | | | |
| 3. Ease of access to area | >50 km to nearest town via secondary/ prov. gravel road | <50 km to nearest town via secondary/ prov. gravel road | <50 km to nearest town via tarred road | V |
| 4. Accommodation offered in area | None | Camping | Camping and guest house | |
| 5. Potential for packaging with other tourism products | None | Associated cultural assets | Other adventure sports activities and/ or events | C |
| 6. Scenic ambience or beauty and sense of place | Degraded environment without scenic ambience or beauty and sense of place | High level of degradation detracts from scenic ambience or beauty and sense of place | Some degradation detracts from scenic ambience or beauty and sense of place | Ou pri |
| *BOULDERING COMPONENT* | | | | |
| 7. Area's bouldering reputation | None | Local | National | |
| 8. Range of bouldering grades represented | One Font number grade | Two Font number grades | All Font number grades | A |
| 9. Potential for new bouldering development in area | None | Projects or new variations of problems | New problems | |
| 10. Index of bouldering area attraction values | ≤4 | 5-13 | 14-22 | |

| ***D. DAMAGE SENSITIVITY*** | ***VULNERABILITY/ROBUSTNESS RATING* (*Score value*** | | | |
|---|---|---|---|---|
| | **None (0)** | **Low (1)** | **Medium (2)** | |

| | | | | |
|---|---|---|---|---|
| 1. Climbing community representation | None | Local | National | |
| 2. Conservation status | None | National park or private conservation area | Wilderness area | W |
| 3. Bouldering field sensitivity: area value | None | ≤25% of fields with high sensitivity index value | 26-50% of fields with high sensitivity index value | 5 |
| 4. Risk of new bouldering development | No new development possible or allowed | Development controlled by formal management, supported by climbing community | Development reported to management, controlled by informal management | N |
| 5. Potential negative impact of high visitation on social fabric of local communities | None | Low | Medium | |
| 6. Level of cooperation between climbing community and management agency in area | Climbing organisation is formal management agency | Formal partnership | Informal partnership | |
| 7. Index of bouldering area sensitivity values | ≤3 | 4-9 | 10-15 | |

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# AARD VAN NEURO-MOTORIESE INPERKINGS BY 7- EN 8-JARIGE LEERDERS MET LEERHINDERNISSE

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***ABSTRACT***

*This study aimed to determine the extent of neuro-motor impairments in 7 to 8 year-old children with barriers to learning and the possible relationship of such impairment to specific learning areas. Sixty-eight learners with a mean age of 7.5 years (SD=0.43) (45 boys; 23 girls) were selected to represent a group (n=31) experiencing learning barriers (BL-group) and a group without barriers to learning (n=37). The BL-group (21 boys; 10 girls) received learning support in Grade 1 and was in Grade 2 during the data collection. The Quick Neurological Screening Test II (QNST-II) and the Sensory Input Systems Screening Test were used as assessment instruments. The independent t-test was used to analyse differences between the groups ($p<0.05$), while a correspondence analysis was used for the two-way analysis of variance to establish a multi-dimensional representation of barriers to learning in specific learning areas. Statistical ($p\leq0.05$) and practical ($d\geq0.8$) significant neuro-motor group differences were found, especially in visual, auditory and tactile perception and gross motor skills. Writing skills was the learning area that was mostly influenced by the different items of the QNST-II, while the QNST-II total score showed relationships with moderate difficulties in reading and writing and with severe difficulties in mathematics.*

**Key words:** Learning barriers; Perceptual-motor skills; Gross motor; Fine motor; Reading; Writing; Mathematics.

## INLEIDING

In die Nasionale Strategie vir Sifting, Identifisering, Assessering en Ondersteuning (SIAS), meld die Suid-Afrikaanse Departement van Basiese Onderwys dat 15 000 leerders van 2004 tot 2007 vanuit hoofstroomskole na hulpbron- of spesiale skole verwys is (SADvO, 2008). Weens dié groot aantal leerders wat verwys word, is hulpbron skole oorvol en meer leerders met leerhindernisse moet gevolglik in hoofstroomskole geakkommodeer word. Artikel 84 van die 1996 Suid-Afrikaanse Skole Wet (ACTS), wettig verder dat geen leerder weggewys kan word by hoofstroomskole nie, wat die belangrikheid van die ondersteuning van leerders in die hoofstroom skole bevestig.

Die Departement van Basiese Onderwys (SADvO, 1997), beskryf leerhindernisse as die onvermoë van die opvoedkundige sisteem om diversiteit te kan akkommodeer, wat tot agteruitgang in leer bydra, of wat die leerder se toegang tot opvoedkundige dienste belemmer. Vanuit 'n sistemiese beskouing, kan hierdie hindernisse intern (leerder self), of ekstern (die skool, opvoedkundige sisteem en/of breër sosiale, ekonomiese en politiese konteks), van aard wees (Landsberg *et al.*, 2005).

Mutti *et al*. (1998) is van mening dat matige- tot ernstige leerhindernisse met 'n inperking in die neurologiese sisteem van die kind geassosieer kan word en gevolglik na interne beperkende faktore verwys. Hierdie neurologiese inperkings kan persepsie, taal, impuls en motoriese beheer, tydens die ontwikkelingsjare beïnvloed. Probleme wat hieruit voortspruit kan mettertyd vererger omdat dit die basis van die leerproses en van gedrag vorm. Onvoldoende perseptuele vaardighede, swak leervaardighede en 'n onvermoë om te konseptualiseer, het 'n kumulatiewe effek, en die resultaat is 'n groter wordende, oneweredige ontwikkeling (Mutti *et al.*, 1998).

Volgens Dewey *et al.* (2002) beskik alle kinders met motoriese agterstande oor die risiko om leerhindernisse te ervaar. 'n Goed funksionerende neurologiese- en motoriese sisteem is gevolglik belangrik vir effektiewe leer om plaas te vind. Sattler en Lowenthal (2006) onderskei verskeie leerareas wat deur leerhindernisse beïnvloed kan word, naamlik spelling, skrif, wiskunde asook lees en daar word verder gerapporteer dat neuro-motoriese uitvalle wel 'n beduidende rol in hierdie leerareas kan speel (Mutti *et al.*, 1998). Navorsing toon ook dat perseptuele-, groot- en fynmotoriese tekortkominge tot leerhindernisse kan bydra (Mutti *et al.*, 1998; Dewey *et al.*, 2002; Wessels *et al.*, 2009, Pienaar *et al.*, 2013).

Persepsie verwys na die vermoë van die brein om inligting te verwerk wat ontvang word vanaf die proprioseptiewe-, taktiele-, visuele- en ouditiewe sisteme (Pienaar, 2007). Die proprioseptiewe sisteem hou verband met liggaamsbewustheid, balans, lateraliteit, middellyn-kruising, dominansie en ruimtelike oriëntasie, en kan skrif, lees, spelling en wiskunde beïnvloed (Cheatum & Hammond, 2000). Taktiele persepsie kan skrif beïnvloed (Landsberg *et al.*, 2005), deurdat dit tot 'n foutiewe potloodgreep (McMurray *et al.*, 2009), onnodige druk op die papier, vermoeidheid van die hand en klein bewerige skrif kan bydra (Nel *et al.*, 2012).

Onvoldoende visuele persepsie kan veroorsaak dat die korrekte betekenis nie aan visuele inligting geheg kan word nie wat tot uitdagings met skrif, lees, spelling en wiskunde aanleiding kan gee (McMurray *et al.*, 2009). Ouditiewe persepsie is belangrik om klanke, letters of woorde met ouditiewe ooreenkomste van mekaar te onderskei (Nel *et al.*, 2012). Gevolglik, wanneer 'n uitval ten opsigte van ouditiewe persepsie voorkom, sal spelling en lees

nie effektief kan plaasvind nie. Die vestibulêre sisteem koördineer en modifiseer verder alle inligting wat afkomstig is van die proprioseptiewe-, taktiele-, visuele- en ouditiewe sisteme (Cheatum & Hammond, 2000). De Quiros (1976) is van mening dat die vestibulêre sisteem dié funksie is wat moontlik met alle interne leerhindernisse verband hou.

Hoewel daar kontroversie in die literatuur bestaan oor die rol van perseptuele vaardighede in leerintervensie (Nel *et al.,* 2012), beklemtoon verskeie navorsers die invloed van perseptuele vaardighede op akademiese prestasie (Mutti *et al.,* 1998; Tseng & Chow, 2000; Pienaar, 2008; McMurray *et al.,* 2009; Van Hoorn *et al.,* 2010; Westendorp *et al.,* 2011; Pienaar *et al.,* 2013). Hierdie perseptuele vaardighede sluit grootmotoriese vaardighede soos balans, ruimtelike oriëntasie, liggaamsbewustheid, koördinasie, ritme en tydsberekening, asook lokomotoriese vaardighede in. Uit die literatuur blyk dit verder dat fynmotoriese vaardighede 'n direkte invloed op skrif het (Cheatum & Hammond, 2000; Sattler & Lowenthal, 2006; Van Hoorn *et al.,* 2010), en daarby ook spelling (Nel *et al.,* 2012) en wiskunde (Mutti *et al.,* 1998) kan affekteer.

Literatuurbevindinge bevestig gevolglik dat verskeie neuro-motoriese uitvalle, vergestalt in groot-, fyn- en perseptueel-motoriese tekortkominge, tot leerhindernisse kan aanleiding gee. Geen resente navorsing kon opgespoor word wat leerhindernisse met die *Quick Neurological Screenting test-II* (QNST-II) toetsbattery (wat neuro-motoriese uitvalle identifiseer) by leerders ondersoek het nie. 'n Studie deur Parush *et al.* (2002) het wel die betroubaarheid van die QNST-II ontleed om perseptueel-motoriese uitvalle te bevestig wat op 'n 97% akkuraatheid gedui het. Verskeie navorsers het wel studies op leerders met leerhindernisse uitgevoer en verbande tussen grootmotoriese uitvalle en leerhindernisse gerapporteer (Woodard & Surburg, 2001; Vuijik *et al.,* 2011). Navorsers (Son & Meisels, 2006; Pienaar *et al.,* 2013), beklemtoon verder die invloed van grootmotoriese vaardighede op akademiese sukses. Westendorp *et al.* (2011) het in hierdie verband grootmotoriese sub-toetse met verskillende leerareas vergelyk, en rapporteer swakker lokomotoriese- en objekbeheer-vaardighede by leerders met leerhindernisse. 'n Sterk verband word verder tussen lokomotoriese vaardighede en lees deur die navorsers gerapporteer, asook die moontlikheid dat objekbeheer 'n verband met wiskunde toon (Westendorp *et al.,* 2011).

## DOEL VAN DIE NAVORSING

Geen van vermelde studies is op Suid-Afrikaanse leerders met leerhindernisse uitgevoer nie, wat gevolglik 'n leemte in die navorsingsliteratuur in die verband uitwys. Die doel van hierdie studie was gevolglik eerstens, om die aard van neuro-motoriese uitvalle by 7- en 8-jarige leerders met leerhindernisse te bepaal. Tweedens, wou bepaal word of sekere neuro-motoriese uitvalle groter ooreenkomste met betrekking tot spesifieke leerareas (skrif, spelling, wiskunde en lees) toon. Hierdie inligting is belangrik vir die optimalisering van leerderondersteuning sowel as vir die identifisering van spesifieke leerhindernisse ten opsigte van leerareas.

## METODOLOGIE

### Proefpersone

'n Eenmalige dwarsdeursnit-opname, wat leerders met (Groep 1) en sonder leerhindernisse

(Groep 2) ingesluit het, is vir die doeleindes van hierdie beskikbaarheidstudie gebruik. Agt-en-sestig leerders (45 seuns en 23 meisies) is vanuit drie hoofstroom skole in die Johannesburg area, Gauteng, geselekteer om aan hierdie studie deel te neem. Groep 1 (n=31) met 'n gemiddelde ouderdom van 7.58 jaar (SA=0.43), het bestaan uit leerders (seuns: n=21; meisies: n=10) wat leerondersteuning tydens Graad 1 vir ongeveer 6 maande ontvang het, en tydens die toetsings in Graad 2 was. Hierdie leerders is deur individuele assessering van onderwysers geïdentifiseer waarin aangedui is in watter spesifieke leerareas (spelling, skrif, wiskunde en lees) 'n leerder hindernisse ervaar. Groep 2 (n=37) vanuit een hoofstroom skool in Johannesburg is uit leerders met geen leerhindernisse saamgestel. Die groep se gemiddelde ouderdom was 7.54 jaar (SA=0.31) en het bestaan uit 24 seuns en 13 meisies wat verteenwoordigend van Groep 1 met betrekking tot ouderdom en geslag geselekteer is.

## Meetinstrumente

### *Die "Quick Neurological Screenting test-II" (QNST-II)* [Mutti *et al.* (1998)]

Die QNST-II toetsbattery (Mutti *et al.,* 1998) is gebruik om spesifieke neuro-motoriese komponente te evalueer wat verband hou met leerverwante probleme. Die toets bestaan uit 15 items, naamlik: handvaardigheid, figuurherkenning en na-teken, palmvorm-herkenning, visuele navolging, klankpatrone, vinger-na-neus, duim-en-vinger-sirkels, dubbele-gelyktydige-hand-en-wang stimulasie, vinnige verwisselende handbewegings, arm-en-been ekstensie, haktoonloop, eenbeenstand, huppel, links/regs diskriminasie en gedragsafwykings. Hierdie items meet die sensoriese persepsie, sensoriese funksionering sowel as groot- en fynmotoriese vaardighede van leerders (Mutti *et al.,* 1998). Punte is volgens spesifieke kriteria aan elkeen van die items toegeken (1 of 3) en die totaal vir elke item is afsonderlik hieruit bereken.

Die totaal behaal vir elk van die 15 items en die groottotaal (die som van die subtotale), word dan volgens norme as neurologies normaal (25 en minder), 'n matige (26 tot 50) of ernstige uitval (50 en meer) geklassifiseer. 'n Leerder wat binne die ernstige klassifikasie val, sal waarskynlik ernstige leerhindernisse in klasverband ervaar, terwyl die leerder met 'n matige klassifikasie nie volgens die verwagte ouderdomsvlak sal presteer nie, en die oorsprong van sy uitvalle kan neurologies of ontwikkeling van aard wees (Mutti *et al.,* 1998). Statisties betekenisvolle korrelasies word tussen die QNST-II en verskeie ander toetse gevind en korrelasies tot so hoog as 0.81 word gerapporteer (Mutti *et al.,* 1998). Hoewel die toets nog nie 'n validasie proses binne die Suid-Afrikaanse konteks ondergaan het nie, rapporteer Parush *et al.* (2002) dat 97% van leerders met perseptueel-motoriese uitvalle, korrek deur die QNST-II geïdentifiseer is. Volgens Mutti *et al.* (1998) voorsien die QNST-II konstante metings wat relatief vry van foute is en word korrelasies van 0.7 en hoër ten opsigte van betroubaarheid vir items en tot 0.97 vir die QNST-totaal gevind.

### *Sensoriese Invoer-siftingsmeetinstrument (SISM)*

Pyfer (1987;1988) het 'n Sensoriese Invoer-siftingsmeetinstrument (SISM) ontwerp wat uit die volgende items bestaan: ekwilibrium-; vestibulêre funksionering, reflekse en ekwilibriumreaksies-; bilaterale integrasie-; kinestese-; en visuele toetsitems. Die meetinstrument is 'n kriteriumgebaseerde meetinstrument wat dit geskik maak vir die gebruik vir ouderdomsgroepe vanaf 6 jaar (Auxter *et al.,* 1997). Vir die doeleindes van hierdie studie is slegs die ekwilibrium- en vestibulêre funksionering toetsitems van die genoemde toetsbattery as aanvullend tot die QNST-II gebruik aangesien De Quiros (1976) die

vestibulêre sisteem as dié moontlike funksie beskryf wat met alle interne leerhindernisse verband hou. Vir ekwilibriumreaksies en vestibulêre funksie is 'n telling van 1 toegeken wanneer geen uitvalle waargeneem is nie en 'n telling van 2 indien van die kriterium afgewyk is.

**Navorsingsprosedure**

Die etiekkomitee (NWU-0070-09-A1) van die Noordwes-Universiteit, Potchefstroomkampus het etiese goedkeuring vir die uitvoering van die studie verleen, sowel as die skoolhoofde van die betrokke skole. Leerders met (Groep 1) en sonder leerhindernisse (Groep 2), wie se ouers

toestemming daartoe verleen het dat hulle aan hierdie studie mag deelneem, is geëvalueer ten opsigte van neuro-motoriese uitvalle. Die toetsprosedure is verder ook verbaal vir elke leerder verduidelik en alle vrae wat die leerders gehad het, is beantwoord. Die leerders met en sonder leerhindernisse is deur onderwysers geïdentifiseer en binne 1 week tydens skoolure getoets. Die toetsings is uitgevoer deur opgeleide Kinderkinetici, wat 'n graad in Menslike Bewegingskunde met nagraadse spesialisering in motoriese ontwikkeling gehad het.

**Statistiese prosedures**

Die *"Statistica for Windows 2011"* Statsoft–rekenaarprogrampakket is gebruik vir die dataverwerking (StatSoft, 2011). Data is eerstens vir beskrywingsdoeleindes aan die hand van rekenkundige gemiddeldes ( $\overline{x}$ ), standaardafwykings (SA) en minimum en maksimum waardes ontleed (StatSoft, 2011). Daar is van onafhanklike t-toetsing gebruik gemaak, om te bepaal of daar verskille tussen leerders met en sonder leerhindernisse met betrekking tot die geselekteerde veranderlikes is. 'n P-waarde kleiner of gelyk aan 0.05 is gebruik om statistiese betekenisvolheid van verskille te bevestig. Effekgroottes (d) is ook bereken om die praktiese betekenisvolheid van verskille te bepaal (Cohen, 1988), met waardes van $d \geq 0.2$, $d \geq 0.5$ en $d \geq 0.8$ wat onderskeidelik 'n klein, matige en groot praktiese betekenisvolheid verteenwoordig. 'n Ooreenkomsanalise is gebruik om twee-rigtingtabelle te ontleed om sodoende 'n multidimensionele voorstelling van leerhindernisse ten opsigte van skrif, spelling, lees en wiskunde te verkry, waar dit met matige en ernstige uitvalle in die onderskeie neurologiese veranderlikes vergelyk kan word (Van der Heijden, 1985). Die Pearson Chi-kwadraat word as betekenisvol beskou by 'n waarde van $p \leq 0.05$, terwyl die Phi-koëffisiënt by $w \geq 0.1$ 'n klein praktiese betekenisvolheid, by $w \geq 0.3$ 'n matige betekenisvolheid en by $w \geq 0.5$ 'n groot betekenisvolle effek aandui.

**RESULTATE**

Tabel 1 bied die beskrywende inligting van die proefpersone (N=68) wat aan die studie deelgeneem het en in 'n groep met (Groep 1) en sonder leerhindernisse (Groep 2) verdeel is, aan. Die gemiddelde ouderdom van Groep 1 (n=31) was 7.58 jaar (SA=0.43) en dié van Groep 2 (n=37) was 7.54 jaar (SA=0.31). Beide groepe het meer seuns as meisies ingesluit.

***TABEL 1:*** **OUDERDOM VOLGENS GESLAG VAN LEERDERS MET EN SONDER LEERHINDERNISSE**

| | **Groep met leerhindernisse (Groep 1)** | **Groep sonder leerhindernisse (Groep 2)** |
|---|---|---|

| Ouderdom | Seuns n=21 | Meisies n=10 | Totaal N=31 | Seuns n=24 | Meisies n=13 | Totaal N=37 |
|---|---|---|---|---|---|---|
| Rek. Gemiddelde (RG) | 7.62 | 7.51 | 7.58 | 7.57 | 7.48 | 7.54 |
| Standaardafwyking (SA) | 0.41 | 0.47 | 0.43 | 0.31 | 0.31 | 0.31 |

Die tipe leerareas waarin die leerders in die groep met leerhindernisse, hindernisse ervaar het, word in Tabel 2 volgens geslag in persentasie uitgedruk. Wat die leerders met leerhindernisse (soos deur onderwysers aangedui) betref, het meer seuns hindernisse met spelling (80.95%), lees (85.7%) en skrif (66.7%) in vergelyking met die meisies (80%, 80% en 60% respektiewelik), ervaar. Wat wiskunde betref, het al die meisies (100.0%) hindernisse teenoor slegs 61.9% van die seuns ervaar. Die grootste persentasie uitvalle van al die leerders in hierdie groep, het tydens lees (83.9%) voorgekom. Geen leerders in die groep sonder leerhindernisse het probleme in enige van hierdie leerareas ervaar nie.

***TABEL 2*: GROEP 1: TIPE EN PERSENTASIE LEERHINDERNISSE VOLGENS GESLAG**

| Leer area | Groep met leerhindernisse (Groep 1) | | | | | |
|---|---|---|---|---|---|---|
| | Seuns (n=21) | | Meisies (n=10) | | Totaal (N=31) | |
| | n | % | n | % | N | % |
| Spelling | 17 | 80.95 | 8 | 80.00 | 25 | 80.64 |
| Lees | 18 | 85.71 | 8 | 80.00 | 26 | 83.87 |
| Skrif | 14 | 66.66 | 6 | 60.00 | 20 | 64.51 |
| Wiskunde | 13 | 61.90 | 10 | 100.00 | 23 | 74.19 |
| Kombinasie van bg. | 9 | 42.85 | 6 | 60.00 | 15 | 48.39 |

Die persentasie neuro-motoriese uitvalle, soos uit die QNST-II resultate bereken wat die groepe in kategorieë van geen (1), matig (2) en (3) ernstige neuro-motoriese hindernisse klassifiseer, word in Tabel 3 aangedui.

Dit blyk dat 10 van die 15 komponente van die QNST-II (figuurherkenning en nateken, palmvorm-herkenning, klankpatrone, vinger-na-neus, duim-en-vinger sirkels, gelyktydige-hand-en-wang stimulasie, vinnige verwisselende handbewegings, arm-en-been ekstensie, haktoonloop en gedrag), asook die QNST totaal het praktiese- ($d \geq 0.3$) en statistiese ($p \leq 0.05$) betekenisvolle verskille tussen die twee groepe opgelewer. Handvaardigheid, visuele navolging en huppel het slegs praktiese betekenisvolle verskille opgelewer. Die groep met leerhindernisse (Groep 1), het telkens groter persentasies as leerders in die matige en ernstige klasse vir neuro-motoriese uitvalle opgelewer. Slegs die eenbeenstand en links/regs diskriminasie het geen verskille tussen die groepe getoon nie.

Tabel 4 dui die verskille in die persentasie neuro-motoriese uitvalle van die groepe, soos bereken uit die SISM resultate, en toon 'n medium praktiese- ($w=0.38$) en statistiese ($p=0.001$) betekenisvolle verskil in ekwilibrium reaksies na regs tussen die twee groepe aan. Verder word 'n klein praktiese betekenisvolle verskil in ekwilibrium reaksies ($w=0.22$) waargeneem, alhoewel hierdie verskil slegs grensbetekenisvolheid toon ($p=0.06$). Leerders

met neuro-motoriese uitvalle het in al die toetsitems die grootste persentasie uitvalle in die matige kategorie wat tussen 3.23% en 70.97% gewissel het, getoon.

***TABEL 3*: PERSENTASIE NEURO-MOTORIESE UITVALLE BY LEERDERS MET EN SONDER LEERHINDERNISSE IN DIE QNST-II**

| | | | **Geen uitvalle Klas 1** | | **Matige uitvalle Klas 2** | | **Ernstige uitvalle Klas 3** | | **Pearson Chi-kwadr.** | **Phi Koëffisiënt** |
|---|---|---|---|---|---|---|---|---|---|---|
| **Veranderlikes** | **Gr.** | **n** | % | n | % | n | % | n | p | w |
| 1. Handvaardigheid | 1 | 31 | 77.42 | 24 | 22.58 | 7 | 0.00 | 0 | 0.37 | 0.25* |
| | 2 | 37 | 94.59 | 35 | 5.41 | 2 | 0.00 | 0 | | |
| 2. Figuurherkenning en -nateken | 1 | 31 | 35.48 | 11 | 64.52 | 20 | 0.00 | 0 | 0.001* | 0.53*** |
| | 2 | 37 | 86.49 | 32 | 13.51 | 5 | 0.00 | 0 | | |
| 3. Palm vorm-herkenning | 1 | 31 | 25.81 | 8 | 54.84 | 17 | 19.35 | 6 | 0.001* | 0.51*** |
| | 2 | 37 | 72.97 | 27 | 27.03 | 10 | 0.00 | 0 | | |
| 4. Visuele navolging | 1 | 31 | 22.58 | 7 | 19.35 | 6 | 58.06 | 18 | 0.17 | 0.23* |
| | 2 | 37 | 35.14 | 13 | 29.73 | 11 | 35.14 | 13 | | |
| 5. Klankpatrone | 1 | 31 | 0.00 | 0 | 29.03 | 9 | 70.97 | 22 | 0.001* | 0.66*** |
| | 2 | 37 | 35.14 | 13 | 54.05 | 20 | 10.81 | 4 | | |
| 6. Vinger-na-neus | 1 | 31 | 6.45 | 2 | 41.94 | 13 | 51.61 | 16 | 0.001* | 0.67*** |
| | 2 | 37 | 62.16 | 23 | 35.14 | 13 | 2.70 | 1 | | |
| 7. Duim-en-vinger-sirkels | 1 | 31 | 38.71 | 12 | 29.03 | 9 | 32.26 | 10 | 0.001* | 0.53*** |
| | 2 | 37 | 89.19 | 33 | 5.41 | 2 | 5.41 | 2 | | |
| 8. Gelyktydige hand-en-wang stimulasie | 1 | 31 | 9.68 | 3 | 25.81 | 8 | 64.52 | 20 | 0.001* | 0.55*** |
| | 2 | 37 | 56.76 | 21 | 27.03 | 10 | 16.22 | 6 | | |
| 9. Vinnige verwisselende handbewegings | 1 | 31 | 3.23 | 1 | 16.13 | 5 | 80.65 | 25 | 0.001* | 0.62*** |
| | 2 | 37 | 27.03 | 10 | 54.05 | 20 | 18.92 | 7 | | |
| 10. Arm-en-been ekstensie | 1 | 31 | 3.23 | 1 | 58.06 | 18 | 38.71 | 12 | 0.001* | 0.56*** |
| | 2 | 37 | 29.73 | 12 | 70.27 | 26 | 0.00 | 0 | | |
| 11. Haktoonloop | 1 | 31 | 25.81 | 8 | 38.71 | 12 | 35.48 | 11 | 0.001* | 0.48** |
| | 2 | 37 | 70.27 | 26 | 24.32 | 9 | 5.41 | 2 | | |
| 12. Eenbeenstand | 1 | 31 | 61.29 | 19 | 29.03 | 9 | 9.68 | 3 | 0.98 | 0.02 |
| | 2 | 37 | 59.46 | 22 | 29.73 | 11 | 10.81 | 4 | | |
| 13. Huppel | 1 | 31 | 93.55 | 29 | 0.00 | 0 | 6.45 | 2 | 0.45 | 0.10* |
| | 2 | 37 | 97.30 | 36 | 0.00 | 0 | 2.70 | 1 | | |
| 14. Links/Regs diskriminasie | 1 | 31 | 29.03 | 9 | 70.97 | 22 | 0.00 | 0 | 0.59 | 0.06 |
| | 2 | 37 | 35.14 | 13 | 64.86 | 24 | 0.00 | 0 | | |
| 15. Gedrag | 1 | 31 | 51.61 | 16 | 22.58 | 7 | 25.81 | 8 | 0.02* | 0.34** |
| | 2 | 37 | 81.08 | 30 | 13.51 | 5 | 5.41 | 3 | | |
| QNST-II Totaal | 1 | 31 | 0.0 | 0 | 32.26 | 10 | 67.74 | 21 | 0.001* | 0.77*** |
| | 2 | 37 | 40.54 | 15 | 59.46 | 22 | 0.0 | 0 | | |

w≥0.1*, w≥0.3**, w≥0.5***; p≤0.05*;
1= Groep met leerverwante inperkings, 2 = Groep met geen leerverwante inperkings

***TABEL 4*: PERSENTASIE NEURO-MOTORIESE UITVALLE BY LEERDERS MET EN SONDER LEERHINDERNISSE IN DIE SISM**

| Veranderlikes | Groep | n | Klas 1 % | Klas 1 n | Klas 2 % | Klas 2 n | Klas 3 % | Klas 3 n | Pearson Chi-kwadraat p | Phi Koëffisiënt w |
|---|---|---|---|---|---|---|---|---|---|---|
| Ekwilibrium Regs | 1 | 31 | 29.03 | 9 | 70.97 | 22 | 0.0 | 0 | 0.001* | 0.38** |
| | 2 | 37 | 67.57 | 25 | 32.43 | 12 | 0.0 | 0 | | |
| Ekwilibrium Links | 1 | 31 | 45.16 | 14 | 54.84 | 17 | 0.0 | 0 | 0.06 | 0.22* |
| | 2 | 37 | 67.57 | 25 | 32.43 | 12 | 0.0 | 0 | | |
| Vestibulêre funksionering na Regs | 1 | 31 | 54.84 | 17 | 3.23 | 1 | 41.94 | 13 | 0.83 | 0.74 |
| | 2 | 37 | 62.16 | 23 | 2.70 | 1 | 35.14 | 13 | | |
| Vestibulêre funksionering na Links | 1 | 31 | 58.06 | 18 | 3.23 | 1 | 38.71 | 12 | 0.53 | 0.14 |
| | 2 | 37 | 62.16 | 23 | 0.0 | 0 | 37.84 | 14 | | |

w≥0.1*, w≥0.3**, w≥0.5***; p≤0.05*; Klas 1 = Geen uitvalle, Klas 2 = Matige uitvalle, Klas 3 = Ernstige uitvalle; Groep1 = Leerverwante probleme, Groep 2 = Geen leerverwante probleme

***TABEL 5*: QNST-II: VERSKILLE TUSSEN LEERDERS MET EN SONDER LEERHINDERNISSE**

| Veranderlikes | Groep 1 (n= 31) RG | Groep 1 SA | Groep 2 (n=37) RG | Groep 2 SA | Betekenisvolheid van verskille gvv | t | p | d |
|---|---|---|---|---|---|---|---|---|
| 1. Handvaardigheid | 0.81 | 0.79 | 0.49 | 0.60 | 66 | 1.88 | 0.064 | 0.41 |
| 2. Figuur-herkenning en na-teken | 2.16 | 1.13 | 0.54 | 0.73 | 66 | 7.14 | 0.001* | 1.43* |
| 3. Palmvorm-herkenning | 4.58 | 2.25 | 2.57 | 1.66 | 66 | 4.24 | 0.001* | 0.89* |
| 4. Visuele navolging | 6.00 | 2.76 | 4.81 | 2.70 | 66 | 1.79 | 0.078 | 0.43 |
| 5. Klankpatrone | 10.29 | 1.55 | 5.97 | 3.05 | 66 | 7.14 | 0.001* | 1.42* |
| 6. Vinger-na-neus | 3.65 | 1.54 | 1.38 | 1.04 | 66 | 7.22 | 0.001* | 1.47* |
| 7. Duim-en-vinger-sirkels | 4.10 | 2.04 | 1.97 | 1.54 | 66 | 4.89 | 0.001* | 1.04* |
| 8. Gelyktydige hand-wang-stimul. | 3.29 | 2.40 | 0.81 | 1.22 | 66 | 5.50 | 0.001* | 1.03* |
| 9. Vinnige verwissel. handbew's | 4.87 | 2.29 | 1.49 | 1.54 | 66 | 7.25 | 0.001* | 1.48* |
| 10. Arm-en-been ekstensie | 6.68 | 3.61 | 2.59 | 2.02 | 66 | 5.87 | 0.001* | 1.13* |
| 11. Haktoonloop | 5.87 | 3.00 | 2.86 | 2.55 | 66 | 4.47 | 0.001* | 1.00* |
| 12. Eenbeenstand | 1.42 | 0.89 | 1.35 | 0.86 | 66 | 0.32 | 0.749 | 0.08 |
| 13. Huppel | 0.45 | 1.39 | 0.16 | 0.69 | 66 | 1.12 | 0.268 | 0.21 |
| 14. Links-regs diskriminasie | 2.16 | 1.07 | 1.78 | 1.06 | 66 | 1.46 | 0.149 | 0.36 |
| 15. Gedragsafwykings | 1.52 | 1.29 | 0.46 | 0.90 | 66 | 3.97 | 0.001* | 0.82* |
| QNST-II Totaal | 57.84 | 12.10 | 29.24 | 8.32 | 66 | 11.50 | 0.001* | 2.36* |

RG = Rekenkundige Gemiddelde; SA = Standaardafwyking; gvv = grade van vryheid; p≤0.05*;
n = aantal proefpersone; d≥0.8*; Groep1 = Leerverwante inperkings, Groep 2 = Geen leerverwante inperkings

'n Onafhanklike t-toets is verder uitgevoer op die verskillende items van die QNST-II, asook die QNST totaal om betekenisvolle verskille tussen die twee groepe verder te ondersoek (Tabel 5). Die groep met leerhindernisse (Groep 1), het die hoogste gemiddelde waardes in al

15 items en die QNST-II totaal (57.84 teenoor 29.24), behaal. Al die items buiten handvaardigheid, visuele navolging, eenbeenstand, huppel en links-regs diskriminasie het 'n statistiese ($p \leq 0.05$), en groot praktiese ($d \geq 0.8$) betekenisvolle verskil tussen die twee groepe getoon.

***TABEL 6*: SISM: VERSKILLE TUSSEN LEERDERS MET EN SONDER LEER-HINDERNISSE**

| Veranderlikes | Groep 1 (n=31) | | Groep 2 (n=37) | | Betekenisvolheid van verskille | | | |
|---|---|---|---|---|---|---|---|---|
| | RG | SA | RG | SA | gvv | t | p | d |
| Ekwilibrium Regs | 1.71 | 0.46 | 1.32 | 0.47 | 66 | 3.37 | 0.001** | 0.83*** |
| Ekwilibrium Links | 1.55 | 0.51 | 1.32 | 0.47 | 66 | 1.88 | 0.064 | 0.45* |
| Vestibulêre funksie Regs (sek) | 12.68 | 5.49 | 12.45 | 3.94 | 66 | 0.20 | 0.840 | 0.04 |
| Vestibulêre funksie Links (sek) | 13.69 | 7.08 | 12.41 | 3.37 | 66 | 0.98 | 0.332 | 0.18 |

RG = Rekenkundige Gemiddelde; SA = Standaardafwyking; n = aantal proefpersone; gvv = grade van vryheid; $p \leq 0.05$*; $p \leq 0.01$**; $d \geq 0.2$*; $d \geq 0.5$**; $d \geq 0.8$***.
Groep1 = Leerverwante inperkings, Groep 2 = Geen leerverwante inperkings

Om verskille tussen die groepe te ontleed op die SISM-resultate is 'n onafhanklike t-toets uitgevoer. Tabel 6 toon 'n statistiese- en groot praktiese betekenisvolle verskil ten opsigte van ekwilibrium reaksies na regs ($p=0.001$ en $d=0.83$), terwyl daar 'n klein praktiese betekenisvolle verskil by ekwilibrium reaksies na links ($d=0.45$) tussen die twee groepe voorgekom het, waar die groep met leerhindernisse (Groep 1) die swakste gevaar het. Geen verskille is tussen die twee groepe se vestibulêre funksionering gevind nie.

'n Ooreenkomsanalise is laastens uitgevoer om te bepaal of daar verbande tussen skrif, lees, spelling, asook wiskunde en die verskillende neuro-motoriese toetsitems is, en die resultate word in Tabel 7 gerapporteer. Skrif het met die grootste hoeveelheid toetsitems van die QNST-II 'n verband getoon, gevolg deur wiskunde. Skrif het die grootste hoeveelheid verbande met ernstige uitvalle in verskeie items getoon, gevolg deur spelling en wiskunde. Lees en wiskunde het verder ernstige uitvalle getoon wat verband hou met ekwilibrium reaksies en die vestibulêre funksie soos deur die SISM gemeet. Die QNST-II totaal word met matige leesuitdagings geassosieer, terwyl dit met ernstige skrif en wiskunde uitdagings verband hou.

***TABEL 7*: OOREENKOMS ANALISE: MATIGE (M) EN ERNSTIGE (E) UITVALLE IN SKRIF, LEES, SPELLING EN WISKUNDE**

| Veranderlikes | Skrif | | Lees | | Spelling | | Wiskunde | |
|---|---|---|---|---|---|---|---|---|
| | M uitval | E uitval | M uitval | E uitval | M uitval | E uitval | M uitval | E uitval |
| 1. Handvaardigheid | | | | | | | X | |
| 2. Fig. herken en nateken | X | | | | | | | |
| 3. Palmvorm-herkenning | | X | | | | | | |
| 4. Visuele navolging | | X | | | | X | | |
| 5. Klankpatrone | | X | | | | | | |
| 6. Vinger-na-neus | | | X | | | X | | X |
| 7. Duim-en-vinger sirkels | | X | | | X | X | | |

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 8. Dubbele gelyktydige hand-en-wang stim. | | X | | | | | | |
| 9. Vinnige verwissel. repeterende handbew's | | X | | X | | | | X |
| 10. Arm-en-been ekstensie | | X | X | | | | X | |
| 11. Haktoonloop | | | | | | | | |
| 12. Statiese balans | | X | | | | | | |
| 13. Huppel | | X | | | | | | |
| 14. Links/regs diskrim. | | | X | | | | X | |
| 15. Gedrag | | | | | | X | X | |
| QNST-II Totaal | | X | X | | | | | X |
| Totale aantal uitvalle (15) | **1** | **10** | **4** | **1** | **1** | **4** | **4** | **3** |
| Ekwilibrium Regs | | | | | | X | | X |
| Ekwilibrium Links | | | | | | | | X |
| Vestibulêr Regs | | | | X | | | | |
| Vestibulêr Links | | | | X | | | | |
| Totale uitvalle (4) | **0** | **0** | **0** | **2** | **0** | **1** | **0** | **2** |

**BESPREKING**

Die doel van hierdie studie was om die aard van neuro-motoriese uitvalle by 7- tot 8-jarige leerders met leerhindernisse te bepaal, asook watter verband dit met lees, wiskunde, spelling en skrif toon. Leerondersteuning kan sodoende geoptimaliseer word deur hierdie interne beperkende faktore van leerhindernisse in ag te neem.

Volgens Mutti *et al.* (1998) is prestasie in die toetsitems van die QNST-II, wat in hierdie studie vir vergelykingsdoeleindes gebruik is, 'n aanduiding van die leerder se motoriese ontwikkeling, groot- en fynmotoriese vaardighede, motoriese beplanning en reeksvorming, sin van ritme, ruimtelike oriëntasie, visuele persepsie, ouditiewe persepsie, tas persepsie, balans en vestibulêre funksionering, asook aandag versteurings. Al die genoemde aspekte hou ook tot 'n mindere of meerdere mate 'n verband met lees, skrif, spelling en wiskunde (Mutti *et al.,* 1998; Dewey *et al.,* 2002; Wessels *et al.,* 2009), derhalwe word dit as 'n geskikte meetinstrument beskou om hindernisse wat met hierdie spesifieke leerareas verband hou, te identifiseer (Mutti *et al.,* 1998). Die resultate (Tabel 3) van die studie toon dat daar in die groep met leerhindernisse, 'n groot persentasie leerders in die ernstige kategorie in nege van die 15 komponente en die QNST-II totaal (67.7% teenoor 0.0%), gekategoriseer was, wat daarop dui dat hierdie leerders waarskynlik neuro-motoriese uitvalle het met opvoedkundige betekenis, en dat hulle waarskynlik ernstige leerhindernisse in klasverband sal ervaar. Die probleemareas wat geïdentifiseer is sluit in, probleme met visuele navolging en die namaak van klankpatrone, wat op ouditiewe reseptiewe afwykings kan dui.

Motoriese beplanning, rigting en ruimtelike oriëntasie probleme word geïmpliseer deur die vinger-na-neus toetsitem, terwyl probleme met die duim-en-vinger-sirkels-item dui op swak motoriese beplanning, neuro-motoriese oorvloei van beweging en links/regs diskriminasie probleme. Uitvalle het ook voorgekom in gelyktydige-hand-en-wang stimulasie wat afwykings in persepsie aandui, die vinnige verwisselende handbeweging item wat ritme,

simmetrie en akkuraatheid van bewegingsversteurings uitlig, asook die arm-en-been ekstensie item (spiertonus), en haktoonloop (balans, liggaamsimmetrie, opeenvolging en ruimtelike oriëntasie). Gedrag wat op probleme met visuele navolging, ruimtelike oriëntasie, motoriese beplanning, fynmotoriese vaardighede, tas persepsie, boonste-ledemaat koördinasie, spiertonus, dinamiese balans, gedrag en neuro-motoriese ontwikkeling in geheel dui, is ook uitgewys (Mutti *et al.*, 1998). Hierteenoor is heelwat meer van die groep sonder leerhindernisse in die normale kategorie geklassifiseer (27.0% tot 97.3%), vergeleke met die groep met leerhindernisse (0.0% tot 93.2%), in al die toetsitems, sowel as in die QNST-II totaal (40.5% teenoor 0.0%).

Verder toon die resultate statistiese- ($p \leq 0.05$), sowel as groot praktiese ($d \geq 0.8$) betekenisvolle verskille tussen leerders met en sonder leerhindernisse. Leerders met leerhindernisse het meer betekenisvolle uitvalle ten opsigte van figuurherkenning en na-teken, palmvorm-herkenning, klankpatrone, vinger-na-neus, duim-en-vinger-sirkels, gelyktydige hand-en-wang stimulasie, vinnige verwisselende handbewegings, arm-en-been ekstensie, haktoonloop, gedrags-afwykings, die QNST-II totaal en ekwilibriumreaksies (SISM) na regs, in vergelyking met leerders sonder leerhindernisse getoon. Uitvalle in die toetse dui op hindernisse met visuele-, tas- en ouditiewe persepsie, asook ruimtelike oriëntasie, bilaterale integrasie, spiertonus, dinamiese balans, algehele neuro-motoriese ontwikkeling en ekwilibriumreaksies. 'n Klein praktiese betekenisvolle verskil ($d \geq 0.2$) is verder tussen leerders met en sonder leerhindernisse gevind, waar leerders met leerhindernisse meer uitvalle ten opsigte van fynmotoriese vaardighede (handvaardigheid), visuele navolging, grootmotoriese vaardighede (huppel), links-regs diskriminasie en ekwilibrium reaksies na links getoon het.

Dit blyk dat die volgende neuro-motoriese vaardighede in geheel wel 'n invloed op skrif gehad het: fynmotoriese vaardighede, tas persepsie, visuele navolging, ouditiewe persepsie, motoriese beplanning, boonste-ledemaat koördinasie, spiertonus, statiese balans, grootmotoriese vaardighede (huppel) en neuro-motoriese ontwikkeling. Die invloed van tas persepsie en motoriese beplanning op skrif stem ooreen met 'n studie deur Tseng en Cermak (1993), wat ook 'n sterk soortgelyke verband gerapporteer het. 'n Korrelasie tussen boonste-ledemaat koördinasie en skrif word verder deur Tseng en Chow (2000) bevestig, terwyl fynmotoriese vaardighede volgens Volman *et al.* (2006), die kwaliteit van handskrif bepaal.

Cheatum en Hammond (2000) bevestig ook dat spiertonus en perseptueel-motoriese vaardighede soos statiese balans 'n invloed op skrif kan uitoefen. Dit blyk gevolglik dat al die sensoriese invoersisteme by skryfvaardighede betrokke is. Hierdie studie toon dat lees meer deur ruimtelike oriëntasie, boonste-ledemaat koördinasie, spiertonus, links-regs diskriminasie, neuro-motoriese ontwikkeling in geheel, asook vestibulêre funksionering na links en regs beïnvloed word. Cheatum en Hammond (2000) bevestig die verband tussen spiertonus, links-regs diskriminasie en ruimtelike oriëntasie en lees, terwyl vestibulêre funksionering volgens Pienaar *et al.* (2007) oor die algemeen met leerhindernisse wat lees insluit, geassosieer word.

Volgens die resultate blyk dit dat visuele navolging, ruimtelike oriëntasie, motoriese beplanning, gedrag en ekwilibriumreaksies na regs met spelling geassosieer word. McMurray *et al.* (2009) beaam die rol van ruimtelike oriëntasie en motoriese beplanning op spelling, hoewel verbande met visuele navolging en gedrag nie gerapporteer word nie. Gedragsprobleme wat aandag tekort insluit kan dalk tot agterlosige foute tydens spelling lei, terwyl regressiewe oogbewegings (Landsberg *et al.*, 2005), tot omkerings kan lei en spelling

verder kan affekteer. Ruimtelike oriëntasie, boonste-ledemaat koördinasie, spiertonus, links-regs diskriminasie, gedrag, neuro-motoriese vaardighede in geheel, asook ekwilibrium reaksies na links en regs, het in hierdie studie verbande met wiskunde getoon. Links-regs diskriminasie hou verband met ruimtelike oriëntasie (Nel *et al.,* 2012), en dit is duidelik uit die literatuur dat ruimtelike oriëntasie wel 'n invloed op wiskunde uitoefen (Mutti *et al.,* 1998). Spiertonus kan indirek 'n invloed op wiskunde toon deurdat liggaamspostuur by die lessenaar, asook skrif daardeur beïnvloed kan word (Cheatum & Hammond, 2000).

Geen literatuur kon egter gevind word wat die invloed van boonste-ledemaat koördinasie met wiskunde bevestig nie, hoewel die vestibulêre funksie, wat met leerhindernisse geassosieer word, swak boonste-ledemaat koördinasie kan veroorsaak (Pienaar *et al.,* 2007). Volgens Mutti *et al.* (1998) kan lees, skrif, spelling en wiskunde negatief beïnvloed word deur neuro-motoriese vaardighede, wat groot- en fynmotoriese vaardighede, asook sensoriese- en perseptuele prosesse insluit.

## SAMEVATTING

Die studie toon eerstens dat leerders wat leerhindernisse ervaar wel oor 'n verskeidenheid neuro-motoriese uitvalle beskik wat sensoriese invoer, perseptuele-, groot- en fynmotoriese vaardighede insluit, wat nie by leerders sonder leerhindernisse voorgekom het nie. Hierdie resultate stem ooreen met 'n soortgelyke studie van Westendorp *et al.* (2011), wat motoriese ontwikkeling by leerders met en sonder leerhindernisse nagevors het, en betekenisvolle verskille tussen die leerders uitgewys het. Pienaar *et al.* (2013) het betekenisvolle verbande tussen basiese akademiese geletterdheid en perseptueel-motoriese vaardighede van Graad 1 leerders in die Noord-Wes Provinsie van Suid Afrika gevind, terwyl Kokot (2006) verskeie motoriese en perseptueel-motoriese uitvalle by leerders met leerhindernisse in die Tswane-omgewing van Suid Afrika bevestig.

Die resultate het verder ook getoon dat sekere neuro-motoriese uitvalle groter verbande met sekere leerareas soos skrif, lees, spelling en wiskunde as andere toon. Hierdie nuwe kennis is belangrik vir die optimale ondersteuning van leerders wat leerhindernisse in spesifieke leerareas ervaar. Beperkte navorsing (Westendorp *et al.,* 2011; Pienaar *et al*., 2013), is egter gevind oor hierdie verbande tussen spesifieke motoriese uitvalle en die verskillende terreine van leerareas waarmee die resultate vergelyk kon word. Gevolglik lewer die studie 'n bydrae ter bevestiging dat neuro-motoriese uitvalle as interne beperkende faktore, kan bydra tot leerhindernisse by leerders, asook op die gebied van leerondersteuning, waar meer kennis beskikbaar gestel word oor die aard en ernstigheid van leerhindernisse wat neuro-motories van aard kan wees. Indien hierdie neuro-motoriese agterstande vroegtydig geïdentifiseer en aangespreek kan word deur kinderkinetici, onderwysers en ander terapeute wat met kinders met leerhindernisse werk, kan dit gevolglik daartoe bydra dat skoolbeginners dalk minder leerhindernisse sal ervaar.

## AANBEVELINGS

Die studie is gebaseer op 'n beskikbaarheidstudie wat gevolglik leemtes met betrekking tot die veralgemeenbaarheid van die resultate inhou. Daar word derhalwe aanbeveel dat 'n groter steekproef wat met leerhindernisse gediagnoseer is, vir toekomstige studies gebruik moet word om die resultate van die studie te bevestig. Verder word daar ook aanbeveel dat

verskillende leerondersteuningsprogramme saamgestel word en die effek daarvan ondersoek moet word. Sodoende kan neuro-motoriese agterstande en leerhindernisse wat verband hou met mekaar, aangespreek word.

## SUMMARY


### The nature of neuro-motor impairments in 7 to 8 year old children with barriers to learning

The literature shows that perceptual, gross and fine motor development plays an important role in academic performance and that barriers to learning may occur when these motor functions are inhibited (Mutti *et al.,* 1998; Dewey *et al.,* 2002; Wessels *et al.,* 2009; Pienaar *et al.,* 2013). Limited research could, however, be found regarding the possible relationship between neuro-motor skills and specific areas of learning, such as in reading, writing, spelling and mathematics (Westendorp *et al.,* 2011).

The aim of the study was to determine if neuro-motor impairments were present in 7 to 8 year old children with barriers to learning, and the possible relationship that such impairments could have with different learning areas, such as reading, writing, mathematics and spelling. Sixty-eight learners (45 boys and 23 girls) were selected for the study and represented a group with barriers to learning (n=31) with a mean age of 7.58 years (SD=0.43) and a control group (n=37) with no barriers to learning with a mean age of 7.54 years (SD=0.31). The group with barriers to learning consisted of learners (boys, n=21 and girls, n=10), that received learner intervention in Grade 1 and were in Grade 2 during data collection, and who experienced difficulty with mathematics, reading, writing, spelling or a combination of these learning areas. The Quick Neurological Screening Test II (QNST-II), and the Sensory Input Systems Screening Test were used to assess the neuro-motor development of the learners with barriers to learning. The Statistica for Windows program (StatSoft, 2011) was used to analyse the data where two-way variance tables determined the percentage of neuro-motor impairments experienced by learners with and without barriers to learning. An independent t-test ($p \leq 0.05$ significance) was used to determine the differences between the groups, while small, medium and large effect sizes ($d \geq 0.3$, $d \geq 0.5$, $d \geq 0.8$) established practical significance of these differences. Correspondence analysis (Chi-Square of $p \leq 0.05$) was used to analyse the two-way tables in order to establish a multi-dimensional representation of learning areas (reading, writing, spelling and mathematics), that were present in the children with barriers to learning.

The results indicated that large percentages of the learners with barriers to learning (67.74% versus 0.0%) were categorised with severe neuro-motor impairments in 9 of the 15 items (palm form recognition, visual tracking, sound patterns, finger to nose, thumb and finger circles, double simultaneous hand stimulation of hand and cheek, rapidly reversing repetitive hand movements, arm and leg extension and tandem walk), of the QNST-II and in the QNST-II Total score. More learners in the group without barriers to learning were categorised with normal neuro-motor development (27.03% to 97.30%) in all the items and the QNST-II Total score. There were statistical ($p \leq 0.05$) and practical ($d \geq 0.5$) significant differences between learners with and without barriers to learning. More significant ($p \leq 0.05$) impairments with respect to visual, tactile and auditory perception, as well as spatial orientation, bilateral integration, muscle tone, motor planning, dynamic balance, equilibrium to the right and

overall neuro-motor development were found in children with barriers to learning. These learners also showed practical significant problems with fine motor skills (d=1.43), visual tracking (d=0.43), gross motor skills (skip) (d=0.21), left-right discrimination (d=0.36) and equilibrium to the left (d=0.45), than learners without barriers to learning.

Differences between learners with and without barriers to learning in respect to underlying neuro-motor skills were statistically ($p \leq 0.05$) and practically significant ($d \geq 0.8$), which is considered to be internal constraints of educational significance. Visual, auditory and tactile perception and gross motor skills especially were related to children who experienced barriers to learning in different learning areas (writing, reading, spelling and mathematical). The correspondence analysis showed that most items of the QNST-II were related to writing. These include: visual-perception, auditory perception, tactile perception, visual tracking, spatial relations, motor planning, bilateral integration, muscle tone, gross motor skills and overall neuro-motor development. An analysis of learners with reading difficulty showed that these learners experienced more difficulty with spatial relations, bilateral integration, muscle tone, left-right discrimination and overall neuro-motor development. Visual tracking, auditory perception, spatial relations and behaviour were related to difficulty with spelling. Children who experienced barriers with learning in mathematics, showed more difficulty with fine motor skills, spatial relations, bilateral integration, muscle tone, left-right discrimination, behaviour and neuro-motor development. The results of the study confirmed the role of neuro-motor impairments in children with barriers to learning in reading, writing, spelling and mathematics.

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