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TWO-DIMENSIONAL KINEMATIC ANALYSIS OF CATCH AND FINISH POSITIONS DURING A 2000M ROWING ERGOMETER TIME TRIAL

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ABSTRACT

The kinematic variables of the catch and finish positions of the 2000m rowing techniques in every 500m single ergometer rowing stroke were identified. Five male rowers from the Turkish National Team (Age 21.0±2.0 years; Stature 180.6±3.1 cm; Mass 76.6±5.0 kg; Training experience 7.0±1.0 years), performed a time trial on a Concept IID rowing ergometer. It was recorded by one camera at 100 Hz speed. The 500m, 1000m, 1500m and 2000m rowing strokes were analysed by means of the Simi Motion 6.2 programme. In the catch and finish positions, segments' angles, stroke time, stroke power, stroke velocity and stroke rate were evaluated by using the Friedman test with repeated measures, followed by Wilcoxon test and Spearman correlation coefficient. Significant differences ($p<0.05$) for the distance were found for ankle and elbow angles in the catch position; for knee and ankle angles in the finish position; and stroke time, stroke power, stroke rates between distances. For all measured distances, negative correlations were found between stroke power and ankle angle on the finish position. Positive correlations were found with wrist angle on the catch position at 1500m and 2000m. Elite rowers' performances were not enough to increase the frequency of drive. As the rowing distance got longer, rowers started to change their body angles and action. Performance could be improved by maintaining suitable rowing technique during competition.

Key words: Biomechanics; Rowing; Catch and finish positions; Concept IID rowing ergometer.

INTRODUCTION

For centuries rowing coaches have tried to develop techniques to increase rowing performance with the intention to have effective races, even in bad weather during rowing training (Elliott *et al*., 2003). Rowing is an endurance sport in terms of training science. Although all body muscles are active during rowing, more leg power and less arm power is used. In a successful rowing race, cardiovascular endurance, anaerobic power and technique for the fastest rowing (Page & Hawkins, 2003), as well as forces which are generated through the extension of the legs and trunk and flexion of the arms (Pollock *et al*., 2012), are needed.

Considering energy use in rowing, it has been observed that aerobic energy is used most in a 2000m rowing race. A race lasts 6 to 7 minutes depending on the type of racing boat and standard of the rowers. During racing, 70% of the total energy is aerobic and the remaining 30% is anaerobic energy (Cosgrove *et al*., 1999).

For an effective rowing performance, physical capacity, energy use and application of movements, cardiovascular capacity and a suitably designed boat in terms of mechanics are essential (Baudouin & Hawkins, 2003). Therefore, suitable movement profiles should be designed by analysing the body motion for the sport. Rowing is a cyclical movement (Cerne *et al*., 2013), and the technique consists of positions when catching, driving, finishing and recovery (Smith & Loschner, 2002). A biomechanical evaluation of each position will help to develop suitable techniques for the rower.

Many biomechanical investigations have evaluated both rowing performance on water (Dawson *et al*., 1998; Elliott *et al*., 2003), or on ergometers (Attenborough *et al*., 2012; Pollock *et al*., 2012; Cerne *et al*., 2013; Wilson *et al*., 2013). Ergometer rowing is a complex motor skill. A rower must have a good command of technique, timing and power on an ergometer (Cerne *et al*., 2013). These machines are designed to make rowers move like they would on water (Smith & Loschner, 2002), by simulating the rowing action used on water (Upson, 2003). Although these ergometers have been recognised as a common cause of soft muscle injuries (Bernstein *et al*., 2002; Hase *et al*., 2004; Nowicky *et al*., 2005), they are very useful in performance tests and technical exercises (Elliott *et al*., 2003; Soper & Hume, 2004).

While ergometers, such as *Row Perfect* (Bernstein *et al*., 2002; Elliott *et al*., 2003) and *Stanford* (Nelson & Widule, 1983), have been used in some studies, most researchers have preferred the *Concept II* ergometer in the determination of rowing technique (Smith & Spinks, 1995; Cosgrove *et al*., 1999; Page & Hawkins, 2003; Hase *et al*., 2004; Nowicky *et al*., 2005; Cerne *et al*., 2013). Monitoring systems to collect real-time kinetic and kinematic data have been developed on the ergometer by researchers.

While the rower rows, a two-dimensional stick figure of the rower is displayed above the power profile produced during the drive (power-producing) position of the stroke (Hawkins, 2000). Each sport has its own biomechanical features (Upson, 2003) and these optimum features should be identified. Most rowing experts agree that the proper sequence of motion, in order to maximise both stroke power and efficiency, is to start the row by driving with the legs, then extending the hips and then pulling with the arms last (Martin & Andrews, 2012).

RESEARCH PROBLEM

The aim of this study was to identify the kinematic variables of the catch and finish positions, affecting success in rowing techniques for 2000m and to analyse the continuity of these parameters throughout a time trial by applying a two-dimensional recording technique every 500m of a single ergometer rowing stroke.

METHODOLOGY

Participants

Five male rowers from the Turkish National Team (category of coxless) participated in this

study voluntarily. Their mean age was 21.0±2.0 years, mean stature was 180.6±3.1cm, mean mass was 76.6±5.0 kg and their mean training experience was 7.0±1.0 years. All subjects had previous competitive rowing experience in national and international competitions. The rowing performances of the subjects were measured at the Sports Sciences Research Centre, School of Physical Education and Sports, Kocaeli University. All subjects had no significant musculo-skeletal injury according to their recent medical history.

Procedures

The current study was conducted consistently to comply with the recommendations of the declaration of Helsinki. Before participating in the study, the subjects were informed of the potential risks and benefits of the study. Time trials were done in Kocaeli University's Biomechanic Laboratory in the afternoon at 16h00. Subjects had to refrain from using alcohol, caffeine and ergogenic aids the day before the test.

Subjects performed a 2000m rowing stroke on the *Concept II D* rowing ergometer. The warm-up intensity and duration were self-selected on the ergometer, but were approximately 15 minutes in length. After being given sufficient time for warm-up, their one rowing stroke at the end of 500m, 1000m, 1500m and 2000m were recorded by using one *Basler* A602f 100hz high-speed camera. The camera was placed to the right side of the rowers at a 90º angle of the position of the ergometer. The distance from ergometer to the camera was about 4m. For field calibration, Direct Linear Transformation technique was used and developed by Abdel-Aziz and Karara (1971) and Shapiro (1978). Four calibration points were calculated by using 2m x 2.5m calibration sticks and it was recorded with all rowing positions, which consisted of catching, driving, finishing and recovery.

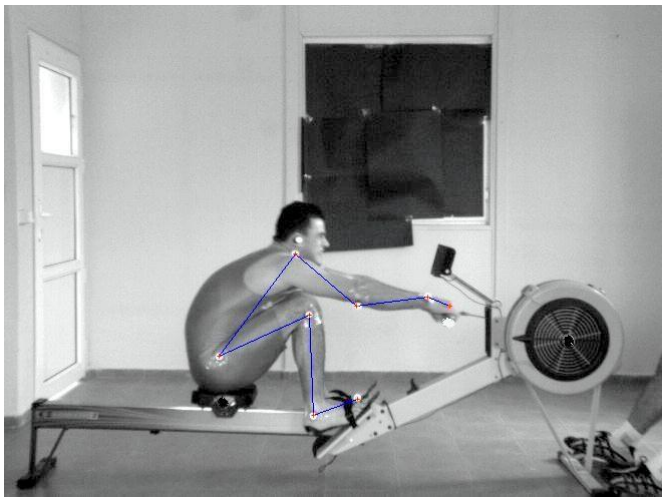


FIGURE 1. **MARKER LOCATIONS AT CATCH POSITION**

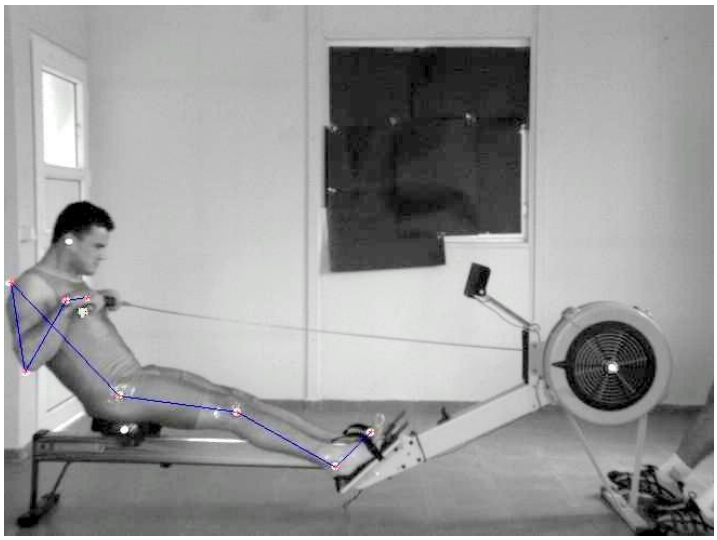


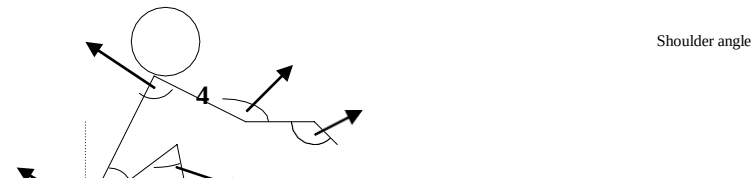
FIGURE 2. **MARKER LOCATIONS AT FINISH POSITION**

Only the catch and finish positions of performance were analysed two-dimensionally using the Simi Motion program (Version 6.2, Reality Motion System, Germany). The angular position changes of the body, knee, hip, ankle, elbow and wrist segments in the catch position and changes of the body, knee, hip, ankle and femur segments in the finish position were evaluated in degrees. Also, stroke power (watt), stroke rate (stroke/second) and stroke time (seconds) were collected from the *Concept II D* screen for each single stroke cycle of the selected distances. In addition, stroke velocity was evaluated by calculating it as m/sec (distance/time).

Joint angles

Reflector markers with a 3cm diameter were attached to the joints of rowers and they were placed on the position of the acromion on the shoulder, olecranon on the elbow, processus styleoideus on the wrist, trochanter major on the hip, epicondylus lateralis on the knee, malleolus lateralis on the ankle, the distal phalanx V, caput phalangae V (Figure 1 & Figure 2).

The ankle angle was connected with the distal phalanx V, malleolus lateralis and epicondylus lateralis; the knee angle was connected with epicondylus lateralis and trochanter major and malleolus lateralis; the hip angle (front side) was connected with trochanter major and acromion and epicondylus lateralis and trunk angle with respect to the vertical; the elbow angle was connected with acromion, olecranon and caput phalangae V, and lastly the wrist angle was connected with olecranon, processes styleoideus and caput phalangae V (Figure 3). The connected segments were brought into motion analysis frame by frame and the segment angles were calculated.



Trunk angle

Hip angle

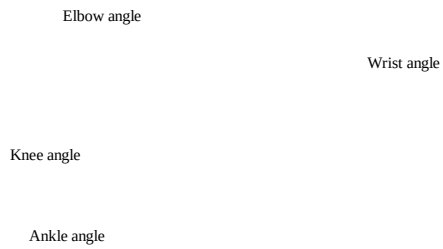


FIGURE 3. **JOINT ANGLES**

Statistical analysis

SPSS version 11.5 for windows (SPSS, Chicago, IL) was used to analyse the data. The statistical analysis was performed using the Friedman Test with repeated measures (non-parametric repeated-measures, ANOVA), followed by Wilcoxon Test to determine significant differences of kinematic and performance variables with each of the distances. The Spearman correlation coefficient between the angular displacement and the performance variables (power, stroke rate, stroke time, stroke velocity), at each of the distances were calculated. The statistical significance level was set at 0.05.

RESULTS

The parameters at 500m, 1000m, 1500m and 2000m were compared using the Friedman Test. Differences were found for the ankle and elbow angle during the catch position at the distances of 500m and 2000m. Also, there were significant differences in the knee angle at the distances of 500m and 2000m, as well as 500m and 1500m in the finish position ($p<0.05$). In the same position, there were significant differences in the ankle angle between the distance of 500m and all the other distances ($p<0.05$) (Table 1 & Table 2).

TABLE 1. **VALUES OF KINEMATIC VARIABLES AT CATCH POSITION**

	Mean ± Standard Deviation for distances covered (m)				
Variables	500m	1000m	1500m	2000m	Overall
Trunk (deg)	42.7±5.0	30.6±7.0	30.8± 6.5	28.4±5.9	33.1±6.48
Knee (deg)	43.3±3.0	43.4±2.0	44.0±4.2	42±3.3	43.2±0.85
Hip (deg)	26.5±5.7	25.6±5.0	27.0±4.0	25.4±5.7	26.1±0.75
Ankle (deg)	67.2±10	73.1±8.2	70.9±7.3	79.5±12	72.7±5.15*
Elbow (deg)	144.5±8.7	143.5±9.6	142.5±8.6	140.4±10	142.7±1.78*
Wrist (deg)	138.7±6.4	134.2±5.6	135.0±12.7	134.9±13.5	135.7±2.02

*$p<0.05$

TABLE 2. **VALUES OF KINEMATIC VARIABLES AT CATCH POSITION**

	Mean ± Standard Deviation for distances covered (m)

Variables	500m	1000m	1500m	2000m	Overall
Trunk (deg)	44.3±4.4	44.3±6.1	47.7±7.0	51.6±1.9	47.0±3.5
Knee (deg)	152.8±8.8	152.8±6.4	146.2±8.3	147.4±8	149.8±3.5*
Hip (deg)	135.5±6	134.3±7.2	133.6±13.6	132.0±10.7	133.8±1.4
Ankle (deg)	117.9±10.6	124.9±8.2	124.7±10.5	124.1±7.2	122.9±3.3*
Thigh (deg)	3.1±2.2	2.7±2.3	2.8±1.6	3.0±1.5	2.9±0.1

*p<0.05

In addition, there were significant differences between the distances in stroke power values, especially between 1500m and 2000m. Stroke power values continued to decrease after 500m, until 1500m, and it reached the highest value at 2000m (Table 3). Furthermore, significant differences in stroke rate values between the distances of 1000m and 2000m; 1500m and 2000m were found (Table 3).

TABLE 3. **VALUES OF PERFORMANCE VARIABLES**

	Mean ± Standard Deviation for distances covered (m)				
Variables	500m	1000m	1500m	2000m	Overall
Power (W)	314.8±4.0	288.4±5.0	271.0±60	324.8±97	299.7±24.5*
Stroke rate (str/min)	28.6±2.9	27.8±2.4	27.8±2.4	29.8±3.1	28.5±0.9*
Stroke time (s)	114.4±1.0	95.4±7.0	222.8±22.0	202.4±13	158.7±6.2
Stroke velocity (m/s)	4.3±0.6	2.38±0.2	1.57±0.2	1.17±0.3	2.3±1.4

*p<0.05

Negative correlations (r= -0.90, -1.00, -1.00, -0.90 respectively) were found between stroke power and ankle angle in the finish position for all measured distances. Positive correlations (r= 0.90, 0.90 respectively) were found for the wrist angle at the catch position of 1500m and 2000m.

DISCUSSION

Rowing is generally divided into four positions, namely catching, driving, finishing and recovery and a full rowing stroke consists of periodic repetition of these positions (Smith & Loschner, 2002; Deakin *et al*., 2004). It is necessary to evaluate each position biomechanically to determine the ideal rowing technique. While some studies have dealt with drive and recovery positions to determine the drive and recovery time ratio (Dawson *et al*., 1998), some studies have studied the catch and finish positions when evaluating body angles (Elliott *et al*., 2003). Similarly, the current study analysed the catch and finish positions of the rowers.

Considering that the determining factors affect success at different distances of the 2000m rowing races, maintaining these factors would be important to improve performance. It was necessary to take a complete row-cycle at the end of 500m, 1000m, 1500m and 2000m into consideration.

Although the value for the upper body segment angle (42.7º) during the catch position, to gain acceleration, was found to decrease at the end of the 2000m (28.0º), no significant difference was found. Elliott *et al*. (2003) found a body angle of 32.4±1.7º in their study and in the study of Upson *et al*. (2003) this parameter was 36.7±8.7º. Similar to these studies, the mean body angle at 2000m was found to be 33.15±6.48º in the current study.

At the catch position, no significant differences were found in angular values of the knee (43.0º), hip (26.2º) and ankle (72.7°). In a study where the 2000m row race on water was assessed, Barrett and Manning (2004) reported knee angles of 47.0±5.0º and hip angles of 25.0±4.0º at the catch position. Upson *et al*. (2003) reported the hip angle to be 26.7±4.2º and Elliott *et al*. (2003) reported the knee angle as being 51.0±2.3º in their study covering 500m. Bell *et al*. (2013) investigated the different intensities for two different inclined back positions of rowing performance. In their study, they found the knee angles at 47.0±8.0º and hip angles as 33.0±7.0º at the catch position. Angular values of segments showed consistency in studies with similar distances, since stroke rate increased as distance in the catch position and, therefore, knee angular values increased. Additionally, the ankle angle, which was initially low (67.3º), increased (79.6º) at the end of 2000m in the catch position. The elbow angle was high at the beginning (144.6º) and decreased (140.4º) at the end of 2000m. These differences were significant ($p<0.05$). In the first period of the race, when the rower moved to the front to produce more speed, the ankle angle was narrower and wider. The reason for this is that the body movement, which is required for the forward motion decreases and the distance increases, thus the ankle angle becomes wider and the elbow angle becomes narrower at the end of 2000m.

At the finish, there were no significant differences in the body, hip and femur angles ($p>0.05$). Barrett and Manning (2004) found the hip angular value to be 110.0±6.0º and Elliott *et al*. (2003) found the femur angle to be 4.0±0.7º and the body angle to be 31.9±2.0º. Bell *et al*. (2013) found a knee angle of 163.0±5.0º and a hip angle of 116.0±5.0º in their study. While values for the body and hip angles were greater than that reported in the literature, the femur angles were similar. This shows that in the finish position in the current study, the rowers moved their bodies into extension, while they also moved their legs to the appropriate extension position.

Significant differences were found in the ankle and knee segment angles at the finish position ($p<0.05$). As the rowing distance increases, the knee angle becomes narrower and ankle angle widens. This can be attributed to the fact that rowers move to a recovery position without bringing their knees to an appropriate extension position, in order to increase rowing rate towards the end of the race.

Rowing power and rowing rates that were high at the end of 500m, decreased at 1000m and 1500m and reached maximum levels at 2000m. Therefore, significant differences were found ($p<0.05$). In their study, Bell *et al*. (2013) found that rowing with a greater inclined back

position produced a significant increase in power output. In the present study, the significant differences of stroke power at the end of 2000m may be due to the greater inclined back position of the rowers, which is similar to findings in the literature. Pollock *et al*. (2009) suggest that coordination of the extensors of the spine and the pelvis, after the catch position, may be an effective strategy to support the spine as forces increase with the initiation of the drive.

Rowing performance depends on the development of the rowers skill and increasing the speed of the boat. The power that rowers apply to the oars and kinetic and kinematic synchronisation among rowers affect rowing speed (Baudouin & Hawkins, 2003). In the current study, since the drive time of rowers shortened as the speed increased, a negative correlation was found between power and drive time. In the study of Schabort *et al*. (1999), which evaluated 2000m drive time, power and heartbeats of well-trained rowers, they established that heartbeat decreased and power increased, although their time improved. By analysing the correlation between angle sizes of the body segments and power, a negative correlation was found between power and the dorsi-flexion angle of the ankle at the finish position. It was observed that rowers reduced the dorsi-flexion angle of the ankle to enable them to apply more power, which did cause the rowers to apply more power. While the angle size of the elbow positively affected speed at 1500m and 2000m, there was a negative correlation for all measured distances between the angles of the ankle at the finish position and speed.

Rowing training can influence kinematic chains and different physiological adaptations can result from training at different stroke rates (Bell *et al*., 2013).

PRACTICAL APPLICATION

The effective transfer of force to the handle of a rowing ergometer is very important for performance. The positions of the rowing stroke start in the catch position at the beginning of power development, followed by muscular actions repeated at various stroke rates depending on the speed and power output. In rowing performance, the stroke rate required for the physical training of a rower and the determination of kinematic parameters are important for the performance rowers achieve. In the mid-distance and long-distance races, the trunk may be used more actively to generate force as compensation for the power loss of knee extension and the fatigue of the quadriceps muscles, especially as a primary force-generating muscle during the stroke, would enhance the understanding of altered stroke kinematics related to fatigue. As the end of the competition approaches, technical defects occur in rowers. These could be eliminated if appropriate training methods had been applied.

CONCLUSIONS

As the rowing distance increased, rowers began to change their body angles (e.g., a greater dorsi-flexion angle of the ankle and a decreased angle of the elbow). Particularly in the finish position, rowers end their motion without completing the leg extension positions. When this occurs, there is a greater inclined back position as evidenced by a higher range of movement and angle of the hip. A significant increase in power output is produced at the end of the rowing stroke. This seems to have had a positive effect on power output on the ergometer.

However, during the real on-the-water event, it could have a negative effect caused by changing the centre of gravity when on water. Performance could be improved by producing and maintaining suitable and effective rowing techniques during competitions.

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A CRITICAL REFLECTION ON SPORT-FOR-DEVELOPMENT DISCOURSES: A REVIEW

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ABSTRACT

The work being done in the area of Sport-for-Development (SfD) or Sport-for-Development and Peace (SDP) has increased in critical mass in the past decade with several of the research paradigms emanating from neo-colonial and neo-liberal traditions in the Global North. Under scrutiny is the collective hegemony of powerful northern stakeholders in multiple partnerships directing 'development' for achieving the Millennium Development Goals through sport. There is a need for original and innovative counter paradigms underpinned by alternative Southern worldviews to challenge these hegemonic (intellectual) practices. Radical post-colonial paradigms inform the interrogation of four prominent discourses relating to: North-South polarisation; positionality in terms of locality and thematic fields; lack of evidence; and a deficit (reduction) model approach. The politics rooted in the academic/donor/NGO complex exposes privileged voices in the neo-colonial space of SfD work that will remain entrenched in Western intelligibility unless exposed to radical transformation and collective agency at all levels of engagement.

Key words: Sport-for-development; Neo-colonial; Neo-liberalism; Global North; Global South.

INTRODUCTION

Various discourses in the field of sport-for-development (SfD) emerged since the United Nations (UN) „declared" sport as an effective tool for achieving the Millennium Development Goals (Beutler, 2008). Seldom has a field developed into a social movement within one decade and enjoyed significant political agency and multi-stakeholder engagement (Kidd, 2008; Hayhurst *et al*., 2011; Suzuki & Kurosu, 2012). Samir Amin, Director of the Third World Forum, questions the „hypocrisy" of political powers (United States, European and Japanese elites), and their hegemony in the UN, as they stand united in their „fight against poverty" (Amin, 2006:4). This critique of „hypocrisy" is also addressed by Kidd (2011), who argued against the uncritical way of making sport part of the international „aid chain" without recognising the ideology behind sport practices and decision-making processes. SDP policy frameworks often package interventions as „apolitical and relevant" (Darnell, 2007). The notion of „development", embedded in „sport development", affords international sport agencies legitimacy to exercise their collective imperialism, and has attracted global sport powers such as FIFA (Fédération Internationale de Football Association) and the IOC (International Olympic Committee) as key stakeholders (Sugden & Tomlinson, 2003).

Kay (2012) describes how SfD carries a high level of political significance in that it is recognised as an extension of the Olympic legacy concept. The rollout of international inspirations to 20 countries as part of the 2012 London Olympic Games bears witness to this, particularly through their „legacy programmes". The concept of „legacy and development" of Third World nations through elite and SfD (life skill based) programmes, is premised on the bourgeois concept of „catching up the historical delay" (Herrera, 2005). Global integration that allows for the flow of foreign capital and expertise, frames an image of political agency for development work in different spheres, including in different sport practices (Pithouse, 2013). The politics rooted in the academic/donor/NGO complex further underpins the construction of paradigms around SfD practices that takes place in a neo-colonial space.

Academic agency and research mostly derive from assessments of diverse SfD interventions that cover a plethora of scientific and methodological approaches. The dominant approaches here were reductionist and positivist logical modelling, with the implication that sport is an

antidote to many social ills and is inherently „good" (Coalter, 2007a; Coakley, 2011). Coalter (2013) spoke out against the deficit model approach and argued that impoverished populations are not inherently „deviant" or suffering from „deficits", but should be understood in the context of their living conditions. People are not merely mechanisms in linear processes of growth and development. Neither is the „poor" an „objective collective" with universal experiences of „living in slums" or „being unemployed" (Pithouse, 2013). We live in complex and different „life worlds" where the local and universal articulate (Dube, 2002). Meaningful insights cannot be generated from a reductionist and Eurocentric view of the African Other without scrutinising the evidence and liberal ideology that frame (Western) ways of knowing (Jaworski, 2012; Coalter, 2013). Deterministic research agendas, often prescribed by funding agencies, impose social control mechanisms rather than illuminate and interpret local knowledge, power struggles and inequalities (Mosse, 2001; Nicholls *et al*., 2011).

The discourse of contextual understandings and capturing privileged „voices", informed recent debate and praxis amongst academia in the field of SfD (Levermore, 2011; Lindsey & Grattan, 2012). Although there are researchers questioning the neo-liberal ideas and practices, alternative frameworks as analytical tools are lacking (Darnell & Hayhurst, 2012). Many researchers schooled in Western research traditions with limited research experience beyond donor-driven impact assessments, pursue uncritical research practices and neo-liberal understandings underpinning them (Kay, 2012).

Western thought concepts come packaged with validation credentials and universal constructs of persuasive morality, such as „human justice", „equality" and „empowerment". Such socio-political constructs have the image of political agency in the global South, but „development work" seldom delivers in terms of „have-nots". Darnell (2007) advocates that SDP work should be integrated into or mainstreamed in all forms of development and should take on a self-critical edge. The question remains, though: what ideological stances would best serve such a critical edge? New World black thinkers like C.L.R. James and W.E.B. DuBois argue that Western Marxists remained unconsciously bound by Eurocentric perspectives (Pithouse, 2013). Without ideological scrutiny, neo-liberal thinking continues to structure debates and Western-centric practices across a range of sectors. This paper aims to interrogate some prominent discourses in the field of SfD and expose the underlying Western socio-political and cultural intelligibility thereof.

THEORETICAL FRAMEWORKS

The first discourse under scrutiny is the *neo-liberal approach* directing the global agenda for SfD (Darnell, 2010a). The „developmental" paradigm underpins global interest in the almost mythical power of sport as a catalyst for societal change. SDP international policy frameworks and UN declarations, advocacy and interventions uncritically propose sport as a low-cost and highly beneficial tool for youth empowerment as a keystone of individual development and agency. Neo-liberal power relations and propaganda chartered the SfD discourse, with some hegemonic resilience and persuasive advocacy by the who"s who of world leaders and capitalist powerhouses (Levermore, 2009; Darnell, 2010a). Addressing global stakeholders, the Secretary General for the UN, Ban Ki-moon (2011), professed that the power of sport is the „good of mankind", saying:

> "Can the sporting fraternity support liberation and transformation through transfer of

> values? Children suffer most from conflict and can regain confidence by taking part in sport. Sport has come a long way in the work of the UN in the past 10 years. Sport has become a world language – a global industry and a powerful tool for progress and development. We have to work together to reach the *Millennium Development Goals*".

The social and political utility value of sport became almost conceptually intertwined with neo-liberal ideology, so much so that it is unquestionably assumed that individuals have the agency and will to bring about an utopian social (democratic) order and improved quality of life. Coalter (2010:296) is outspoken against the mythopoeic and "crudely functionalist assertions about sport‟s socialising and transformative properties". Darnell (2010a) holds the view that SDP programmes are a perpetuation of the colonisation process. Radical thinking and agency, as encapsulated by Badiou‟s Kantian ideas and Césaire‟s advocacy for an „international Left‟, challenge the status quo of powerful neo-colonial networks (Césaire, 2000; Badiou, 2010; Pithouse, 2013). The critique is also directed towards the absorption of (sport) development policies and programmes by Southern partners or subsidiaries. This sentiment is shared by scholars advocating a critical revolutionary praxis for overcoming the inherent neo-colonial „content‟. Many argue for SDP frameworks that may act as a catalyst for bringing about radical transformation in SDP discourse and practice (Ndiritu & Lynn, 2003; Symphorien, 2009).

The blindness to unequal power relations seems an aspect of neo-liberalism, at least as an explicit aspect of neo-liberal discourses premised in notions of individual sovereignty, responsibility and rationality. Northern donors often provide well-resourced SfD programmes laden with colonial ideology to recipient communities in the Global South. The latter are often confronted with the reality of accepting these resources on the terms dictated to them, or remaining without them. Persuasive agendas lead to relationships of „giving-and-receiving‟, with the recipients being responsible for producing the predetermined outcomes. Individuals are held accountable for their own destiny and „progress‟, regardless of structural barriers, which in sport practices may relate to the absence of essential material resources to access sport programmes. Feeding SfD primarily through the local NGO-sector poses challenges of donor-dependency and an uncritical acceptance of resources (including programmes). This relates to a lack of interrogation of *unequal power relations* in terms of ownership of

interventions and the drive towards sustainability in resource-poor environments (Saul, 1997; Andreasson, 2010). Without challenging the sources of power masked in notions of (equal but different), partnerships to spread neo-colonial philosophies and cultural practices, colonial domination in multiple spheres is perpetuated by local populations earmarked for „development‟ (Bray, 2003). SDP interventions, implemented by powerful Northern NGOs and development agencies, seldom demonstrate lasting effects in addressing local needs and priorities.

Poverty is treated as an infliction and the poor as victims of their „own making‟. When „volunteers‟ are recruited among unemployed youth and exploited by low wages (stipends), with training focused on the „delivery of development‟, debates about ethical practices hardly reach the boardrooms (Burnett, 2011a). The relatively short funding periods of many projects compromise the sustainability, or taking up local and many social entrepreneurs (NGOs) play by the rules of the donor, and move from partnership to partnership where funding can be obtained (Burnett, 2011a; Kay, 2012). In this sense, they become the „hands for hire‟ and channels for delivering neo-liberal ideas well vested in programme content and methodology.

In the neo-colonial packaging of „development", local agencies and participants experience relatively little freedom to pursue their own interests or make rational choices bringing about growth and progress on their terms (Symphorien, 2009). Envisaged outcomes and justifications for the SDP work in developing economies often muffle critical voices speaking out against neo-liberal interventions (Spaaij, 2010; Kidd, 2011). Selective evidence provides a justification for the politics of the elites, conceptually rooted in the academic/donor/NGO complex (Spivak, 1999). This rings very true for such as most decision-makers are from the North where privileged voices are mediated in building a case for SDP work.

Implementing partners are equally blinded by notions of delivering „development" to the „common good" of their constituencies, but choose to ignore broader discriminatory, structural and exploitative cultural practices (gender discrimination) (Skille, 2007). Pre-conceived success indicators for development programmes are re-informed by monitoring and evaluation data reporting on selected outcomes. If the goal of „youth leadership" or „empowerment" is a programme directive, evidence is packaged to „attest" to its achievement regardless of the transferability of such programme outcomes or effects (Burnett, 2006; Kay & Spaaij, 2011). Self-professed positive effects on participating families, social institutions and communities reinforce the prevailing assumptions and if „no effects" are noted, there is a high level of blame directed towards an implementing partner (Crabbe, 2007).

Dominant ways of knowing and meaning are *socially constructed* and reflective of very diverse SDP programmes. The neo-liberal individualistic determination (and, by implication, global consensus), contrasts with non-Western-ness and different non-Western epistemologies. For instance, a disparity is reflected in the *Ubuntu* ideology of Southern Africa (found throughout the continent with different terminologies), where a collective consciousness directs life courses, as opposed to the individual consciousness driven by agencies from the Global North (Kotzé, 1993). The embodiment of this ideology in SDP practices in Zambia mainly relates to the role of peer-educators in acting as „real" role models for sport participants in their programmes (Lindsey & Grattan, 2012). Such an Africanist worldview and practices provide the impetus of high levels of bonding and collective activity

rather than fostering individualism or competitiveness (Ndlovu-Gatsheni, 2011). It is a philosophy and way of life where the collective supersedes the individual and interdependency translates into the forming of cohesive teams and social closeness between the coach and participants (Khoza, 2006; Nkondo, 2007).

However, there is not a singular post-colonial South, an „absolute". Such a construction demonstrates fluidity, struggle and contestation as evidenced in the radicalism of Badiou to create an "egalitarian society which, acting under its impetus, brings down walls and barriers" (Pithouse, 2013:92). There are identifiable collectivist elements of different ontological and epistemological frames in the South that underpins radical opposition to colonial thought.

Many political communities emerge within the neo-colonial space created by SfD. A binding force centres around partnerships based on shared sentiments, trust, cooperation and altruism to improve the lives of vulnerable people and „communities in need" (Bond, 2000; Zegeye & Krige, 2001). Such „communitarianism" is anchored in the reality of time and place as framed by Agamben"s insights of how it might transcend beyond the local (Jaworski, 2012). It is also at the heart of the „active citizenship" demonstrated by local peer-educators, which is at the root of the volunteerism on which many development projects depend for implementation and acceptance at community level (Burnett, 2012b). Programmes" reach and „uptake" require

the mobilisation and readiness of and buy-in from vulnerable populations to engage in and benefit from SfD initiatives. Along with notions of belongingness and development of social capital (bonding, linking and bridging), community integration and „transformation" are projected and „assessed" (Burnett, 2006; Coalter, 2013).

Placing *culture and local realities* at the centre of interventions and analyses, a cultural studies framework (developed from a Marxist perspective), provides the mechanisms for understanding prevailing power relations in relation to praxis (as intellectual work with a thrust for practice) (Pope, 2010). At the local levels of programme implementation, unequal power relations and resource availability reflect local layering of socio-political and economic hierarchies (Maru & Woodford, 2005). If a particular NGO is well-resourced and politically connected, the chance of delivering top-down programmes are enhanced. This holds true for the status of those local coaches or peer-educators delivering SfD programmes. Sugden (2011) reports on such effects through working with the youth in conflict zones in Israel. From his critical work in the Occupied Palestinian Territories, it is clear that collectives in local settings are influenced differently by forces of religion, history and the buy-in from local populations. Complex and overlapping power relations and collective resistance are often at play. For instance, dominant views such as patriarchal values and practices in the South show differential manifestations and contested in a myriad ways from within. The individual counts at all levels of engagement and research should unearth such localised realities (Brady, 2005; Harvey *et al*., 2007). This indicates a need for a more complex paradigm and understanding of intersecting „life world" as the individual and collectives experience and react to SDP work (Dube, 2002). An increased body of knowledge is emerging where, by utilising a plethora of disciplinary approaches and methodology, „local voices are captured" (Kay, 2012). However, the complexity of how a sports programme fits into the „life worlds" of individuals and collectives seldom features in broader or longitudinal analyses (Cronin, 2011).

Whereas events create „moments of togetherness", they lack depth, with the consequence that at times the „lingering effect" is one of „no change", or in cases of highly competitive circumstances, they might even intensify mistrust and conflict. The boundaries and temporality of „effects" were indicated by Schulenkorf (2010) in his work on the impact of sport events on ethnic reconciliation between the Sinhalese, Tamil and Muslim sportspersons from Sri Lanka. In another study, by Sherry (2010), the relatively narrow focus provides only a lens of self-assessed changes in the behaviours of homeless sportspersons („Street Socceroos"), who participated in the Australian Homeless World Cup team. Given the complexity of real-life settings and filtered inclusion criteria determined by unequal power relations, the lens should be „wider" and „deeper". SfD programme effects should be interpreted against the sense-making thereof by the participants and beneficiaries within their lived-realities, and within a particular geographical and historical setting.

Leading scholars are increasingly arguing for a more holistic understanding and participative approach capable of rendering multifaceted and nuanced understandings. Retrospective inquiry, typology development (Giulianotti, 2011), the dynamics of social impacts (Sugden, 2011), development dynamic analysis (Burnett, 2011b) and the scrutiny of evidence (Kay, 2012), are all directives for future research and theory construction. The following four discourses informed by neo-liberal ideas speak to persistent ways, reminiscent of earlier paleo-colonialism and what Chakrabarty (2012:142) described as "European domination", justified by "their civilizing mission". These chosen discourses demonstrate a high prominence and prevailing neo-colonial political ideology flowing from a Northern core to

Southern peripheries through socio-political and economic mechanisms (Dieng, 2007).

North-South polarisation

Modern sport, grounded in socially constructed (Western) phenomena, carries, in itself, the global colonial ideology, which is imprinted on the historical, material and contextual landscape of influence and intervention (Saavedra, 2009). These ideologies and „structural adjustments" are ever-present in the SDP as a global force. SDP operates in the context of implementing national co-ownership and completing the loop for masterminding a reductionist and uncritical global agenda for preconceived change (Burnett, 2012a). Coalter (2013) poses the questions of „what change?" and „on whose terms?" as integral in such a debate. In real-world applications, provincializing critical theory shows how powerful elites influenced post-colonial and Indian history after subaltern studies (Chakrabarty, 2012). Such critical work queries dominant SDP narratives (Tiessen, 2011). It calls for radical views and relates to the need for interrogating the ideological underpinnings of scholarly work. If developmental debates are uncritically followed, they may stifle innovation and agency among an emerging research community. It may also perpetuate an agenda dominated by Northern scholars (and neo-liberal paradigms), without questioning the very roots of knowledge production (Burnett, 2012a). It is about insightful and critical research rather than geographical locality. For instance, the work of sport anthropologists on Kenyan running (as a phenomenon), generates new insights of local phenomena that break down stereotypical barriers and bridge the North-South divide (Bale & Sang, 1996). Established scholars should charter new ways of conducting research and address the SDP in a complex way, rather than pursuing a particular disciplinary perspective or personal research interests.

In addition, delivering on the theory construction, layering processes and local understandings of „whiteness" (as opposed to the African Other), demonstrate ethnocentrism and stratified thinking from the standpoint of privilege and respectability (Darnell, 2010b, 2011). Darnell (2011) critiques the viewpoints of „racial" and „class" superiority evident in how international (predominantly white) volunteers reflect on their sport coaching experiences as placements with NGOs in the Global South. Such volunteers, who come from first world countries, are privileged and often relatively well-remunerated compared to their local counterparts. Donors may recruit, train and even pay local implementers under the smokescreen of „empowerment", yet seldom reach beyond labour exploitative practices (Kay & Bradbury, 2009). Many of these employment and „empowerment" opportunities are temporary in nature, and they also do not lead to positive transformation in the lives of individuals and households within impoverished communities, where resources are scarce and unemployment rates consistently high (Burnett, 2011a). It is an issue of perpetuated inequality and partial inclusion masked as notions of empowerment, because training for programme implementation rarely facilitates independence and agency. Making a living out of coaching sport is not a reality, while transferring experience from the sport context to the world of work is equally challenging.

Positionality and disciplinary perspectives

Positionality directly links to the North-South divide with most research agendas being driven by global agencies in the North following (Kidd, 2008 & 2011; Cronin, 2011). The advocacy of the World Health Organisation influenced development agencies and promoted sport as an agent for development (Levermore & Beacom, 2012). Cronin"s *Comic Relief Review* (2011) mentions reports produced between 2005 and 2011 outside the Global North, namely from

South Africa, Kenya and Zambia. With researchers in this field mainly positioned in the Global North, it is to be expected that a small minority (9%) of research will be produced in Africa with even less research produced by sport sociologists. Coakley (2011) showed that 35 of the 265 sources listed (13.2%), were associated with researchers in the field of the sociology of sport with the implication of a limited knowledge pool from this disciplinary perspective.

The England Sport Monitor (2012) is an on-line monitoring service of the most up-to-date reference sources, including critical reviews of published research evidence on the contribution of sport to a range of social issues. Of the more than 144 research publications, most were in the field of „physical fitness and health" (n=36), followed by „participation", as well as „economic impact and the regeneration of local communities" (n=26). „Education and Life Long Learning" (n=18) and „psychological health and well-being" (n=17) were also prioritised in terms of publication frequency, compared to community-related effects, which were captured as „crime reduction and community safety" (n=13) and „social capacity and cohesion". Only a few papers addressed methodological matters and monitoring and evaluation (n=3).

Demarcation of SfD research is problematic, as scholars map the field from their own conceptual frameworks where some multi-disciplinary studies cut across a range of academic and professional fields. A more daunting task for researchers is to provide comparable research across a wide spectrum of delivery models and sport or forms of physical culture (Coalter, 2013). In addition to the sport+ and +sport models (Coalter, 2007a), Burnett (2009)

identified „sport-in-development" or integrated and „comprehensive" approaches. Giulianotti (2011) described three ideal-type models, namely „technical", „dialogical" and „critical" to add to the existing clustering. While the technical SfD or SDP model is underpinned by a realist, positivistic instrumental philosophy, the dialogical SfD/SDP model is rooted in interpretative, communicative philosophy and the critical SfD/SDP model featuring highly reflexive, critical and andragogical approaches (Giulianotti, 2011). All these models appear in different and intersecting ways in the SfD practices and literature.

It is thus a fallacy to view SfD as a clearly demarcated field of scientific inquiry, as sense-making should go well beyond the mere classification or assumed homogeneity (Giulianotti, 2011). The loose arrangements of delivery models and wide spectrum of content, add to the richness of literature, yet diminishes coherence and knowledge flows to advance discourse development. Academic clustering is slowly appearing as scholars interact and find themselves in similar niche areas. One of the main challenges remains to bridge the academic-funder-practitioner divide in a meaningful and coherent way. Academics need to acknowledge their ideological standpoints and interrogate practices and findings so as to ensure that they contribute to a critical body of knowledge and discourse development.

Lack of evidence discourse: Evangelism versus complexity

The lack of evidence discourse followed soon after the myopic dimensions captured in the well-received work of the United Nation"s Inter-agency Task Force on Sport-for-Development and Peace (Beutler, 2008). Since the UN"s agency in promoting SfD, status-quo-maintaining stakeholders mostly consume and dictate related mandates at all levels of engagement. Growing discontent from the academic community accused the NGOs and implementing sectors (mainly practitioners) of evangelism, where leaps of faith and

marketing rhetoric were seldom substantiated by solid evidence. Coalter (2007a, 2010) commented on the broad unrealistic outcomes by asking about what really counted for development, criticising „ill-defined interventions with hard to follow outcomes". First-hand experience with localised development programmes brings in the contextual reality of process analysis. Kay (2012) criticised the lack of resources and local research capacity, and the fact that monitoring and evaluation reports serve as the dominant research base. Both these criticisms have merit, yet her argument does not draw on an in-depth understanding of the whole spectrum of possibilities, nor does it identify clear demarcations of effect, interrelated stakeholder dynamics and causal relationships in determining cause and effect (Burnett, 2012a).

The tension of valid and reliable empirical research produced in a positivistic paradigm satisfied donors who wanted the numbers to be tick-boxed for reaching a wider constituency. Researchers, on the other hand, argued from in-depth research and the inclusion of local voiced response through qualitative methodology and in the interpretation. The NGO-partner, often depended on the funding of the donor, had to play the „numbers game" and would produce narratives in such a bias and confessional way, as to be branded as „evangelism" (Coalter, 2013). Coalter (2013) is critical of such findings, and questions the evidence base of some programmes in Africa (Northern Uganda, Malawi and Kenya). The validity and trustworthiness of the research findings are dependent on the integrity and agency of the researcher to manage this triad.

Academics across a wide spectrum of research interests took up the challenge of framing their research by arguing for innovative methodology and the inclusion of local and contextual knowledge and perspectives (Nicholls *et al*., 2011). Impact assessments increasingly focus on theories of change and tracing the most significant changes at the micro-level of programme engagement and effect (Kay, 2009). Programme delivery and community-level uptake is still absent from studies focusing on producing hard or robust evidence, rather than capturing meaningful data, which might not „prove" effect, but rather indicate the potential contribution and reach of SfD programmes (Coalter, 2010). As phrased by Coalter, with reference to the work of Pisani regarding cultural factors affecting the spread of HIV/AIDS, "the deep rooted complexity of the issues [are] often ignored in policy rhetoric, which too often reduces complex social issues to individual behaviours" (Coalter, 2010:310).

The discourse relates to the limitations of impact assessments that most often lack scientific rigour. It is not necessarily that there is no evidence of change and programme effect, but rather that the broad-based societal change claims are not achievable or there is just no evidence to back them up (Burnett, 2012a). Programme evaluation research mostly follows a limited time span aligned to a particular funding period and Eurocentric normative measures and methodology. Narrowly focused investigations undermine knowledge production and the extrapolation of findings. Meaningful research needs cultural and local relevance and has to follow a developmental approach by serving all constituencies through the application possibilities and rigour of academic scrutiny.

However, well-designed and inter-connected small-scale studies with optimal cultural relevancy can provide rigorous outcomes and findings. In the current economic climate and given the dominance of neo-liberal outlooks, careful and integration research across a range of fields (in the Bourdieu"s sense) remains untapped (Bourdieu & Wacquant, 1992). As funders want to substantiate their claims, it produces fundamental tensions between the kind of critical outlook argued in this article and the programme objectives and evaluation

required. Critical researchers need to build meaningful networks, develop methodologies (including methods), and support systems that can provide the means to mediate the challenge of academic freedom and scrutiny. A developmental framework and understanding of what development work entails, may provide insights that would enable different agendas to integrate. In this way, research can serve the „cause" with resultant agency and strategic direction for all.

Deficit model

Coakley (2011) exposes the neo-liberal ideas and beliefs of the „social problem industry" and the fact that interventions adopted „a deficit reduction model". This approach sees the recipients (especially youth) as „needy victims", but without interrogating structural challenges, they rather focus on behavioural changes (self-efficacy, positive gender attitudes, leadership and HIV/AIDS knowledge relating to responsible sexual practices). This discourse in the SDP space argues for the rejection of the deficit model, which underpins most assumptions of vulnerable populations earmarked for „development" and who are, in some sense, „deviant" (Coalter, 2011). This is reflective of the broader development framework packaged as the „social problems industry", which pays special attention to „at-risk" youth and vulnerable populations (Hartmann & Depro, 2006). This discourse articulates with the neo-colonial and Global North-dominated agenda of „giving" to „recipients" who have been

identified as „deficient" and are, therefore, the target populations for „treatment" and „rehabilitation" as they meet global standards of deficiency. The fact that Northern researchers establish the contrary, and come up with findings of „normality" using non-contextually validated methodologies, is contentious. The very same academics who declared millions of people „deviant", later claimed that the same people were just living in different (extra-ordinary) circumstances (Coalter, 2011). Mosse (2001) and Remenyi (2004) argue that people"s knowledge and „embeddedness" in a particular context (coping with the manifestations of poverty), should be understood differently and their circumstances should be taken into consideration when inter-cultural comparisons are drawn.

This particular discourse illustrates the relative immaturity of the SfD literature and the need for paradigm crossing. Extensive literature on socialisation, identity formation and children"s well-being (including indexes) are ignored by following reductionist paradigms and intentions of shaping sport-related experiences and addressing the perceived needs of recipient constituencies (Haudenhuyse, 2012). For instance, in socio-psychological studies about youth resilience, social learning and social identity formation would provide valuable concepts in addition to studying the reduction of risk factors and the increase of protective factors. Benson and Scales (2009) conducted extensive studies in this field and reflected on the relevance of the positive effect of community-based interventions as explained by the thriving theory and potential of communal plasticity (potential for systemic change). The change may be expressed as intangible or „soft benefits". Such programme-level outcomes find expression in vividly articulated narratives mediated by the academic/donor/NGO complex to bring hope for the hopeless, joy for the joyless and development for the under-developed. They deliver needs-based, rather than asset-based, interventions, and perpetuate notions of dependency inherent in subjective understandings of colonial, neo-liberal thinking (Darnell, 2011).

CONCLUSION

The neo-colonial and neo-liberal philosophies are inherent in most SfD research and programmes initiated in the Global North with relatively unequal power-relationships. Cultural and contextual understandings should inform SDP research designs and endeavours in all its complexity and power (stakeholder) dynamics, but research alone will not bring about the desired changes. Activism in the vein of feminist praxis may contribute to the development of a collective of scholars and stakeholders, loosely constituting a socio-political movement to facilitate radical change. Advocacy stems from a deeper understanding of the social phenomena under scrutiny in service of a human justice framework. Academics and researchers communicating a „view-from-the-South" may find a radical epistemological framework valuable in their advocacy for social change. A strategic research focus may also be beneficial to practitioners and funders, who may come to understand the complexity of development work.

It is up to researchers to produce strategic work within niche fields where they can exercise influence on the scientific community, as well as on all stakeholders, from global to local levels. Discourse always follows practice, so academics face challenges as negotiators of equal partnerships and show agency within their roles and mandates to meaningfully address

and bring about positive and enduring change in SfD spheres within a developmental framework,

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EVALUATING THE OFFENSIVE DEFINITION ZONE IN FOOTBALL: A CASE STUDY

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ABSTRACT

New technological solutions have greatly improved match analysis systems for investigating players' performance. Nevertheless, there still remains a large gap in the collective analysis where improvements need to be made, mainly in the use of automated information gathering. Thus, the aim of this case study was to propose a set of three automated tactical metrics and their respective ratios for use in investigating and estimating the tactical performance of football teams. Three official football matches of the same professional team were analysed and Cartesian information about the position of players and the ball in the field was collected. Using this information, tactical metrics regarding penetration, offensive space and offensive unity were developed. The results showed that the unity principle was the tactical principle most often accomplished at the mean ratio of 0.83 and penetration was the principle performed with the least success (ratio of 0.42). This case study proposes some computational indicators to evaluate the collective performance of football teams whereby football coaches can be provided with some additional information that could be used to characterise their teams.

Key words: Match analysis; Metrics; Tactics; Offensive process; Football.

INTRODUCTION

Performance analysis seeks quantitative and qualitative methods that help to identify, characterise and estimate human performance during sport activities. In football, match analysis aims to assess the collective performance of players during games, to identify

patterns of play and the weakness and strength of players' synchronisations (Clemente *et al*., 2013).

Traditionally, the focus of match analysis has been to characterise the individual actions, using notational analysis to measure the number of passes, shots or balls lost (Hughes & Bartlett, 2002). However, these statistical summaries are an over-simplification of football

matches where the final outcome is the result of complex and dynamic processes of inter-player relationships (Duarte *et al*., 2012). Therefore, only observing the outcomes is insufficient to characterise complex team behaviour. A new vision for the complex process underlying team behaviour is necessary.

Match dynamics need to be supported by strategic and tactical processes that try to improve collective behaviour potentiality (Clemente *et al*., 2013). Tactics and strategy have always had a strong relevance to opposing actions between humans. Nevertheless, tactics and strategy are two different terms that need to be understood differently, considering their different meanings in a sporting context. 'Strategic' relates to the principles of play or the orientation of actions that allow the organisation and preparation of the team in readiness for the match (Bouthier, 1988). On the other hand, 'tactics' relates to operations performed during the game by players in order to adapt the initial requirements to the dynamic constraints imposed by the opposing team.

Thus, strategy is constituted of the elements previously discussed by the organisation (the team) to prepare for the match (Gréhaigne & Godbout, 1995), and relates to the general order, namely to the players' positioning and distribution on the field, as well as their specific missions (Gréhaigne *et al*., 1999). Tactics, on the other hand, relates to the punctual adaptation to new playing configurations as a function of the state of ball possession and the opponents' positions (Gréhaigne & Godbout, 1995). The concept of tactics relates to behavioural adaptation in response to the opponents and the play status. Therefore, there are substantial differences between strategy and tactics at the levels of time and space. Strategies relate to more elaborate cognitive processes, due to the greater amount of time to prepare and the lower level of constraints (Gréhaigne *et al*., 1999). Compared to strategy, the tactical concept involves higher levels of decision-making and behavioural adaptations as a function of the contextual constraints; thus it is decision in action. During the game, tactical behaviour prevails (Gréhaigne *et al*., 1999).

Considering the above, there are some principles underlying the team's strategies and tactical behaviour that provide a higher level of organisation and structure to collective behaviour (Costa *et al*., 2009). Without principles of play, the intra-team relationships may become less organised, which reduces the opportunity to play as a team and as a unit. Thus, over the years, football theory has developed some offensive principles that potentiate collective behaviour and quality of play (Metzler, 1987; Gréhaigne *et al*., 2005; Costa *et al*., 2010).

The offensive tactical principles aim to give fundamental information to players, allowing an improvement in their collective behaviour (Costa *et al*., 2009). These tactical principles provide some behavioural rules for organising and attuning the behaviour of players in accordance with the main goal of the team, namely to successfully create goal-scoring opportunities so that goals are ultimately scored. Thus, tactical principles are essential guidelines for allowing an improvement in the team's collective behaviour in order to

overtake the defensive organisation of the opposing team. According to Costa *et al*. (2010), the five offensive fundamental principles of play in football are: (1) penetration; (2) offensive coverage; (3) depth mobility; (4) width and length (space); and (5) offensive unit. Of these principles, penetration, width and length, and offensive unit were chosen to be the subject of this study.

The penetration principle is characterised by the progress of the attacker with ball possession in the direction of the score zone (Costa *et al*., 2009). The main objective of the attacker is to reach the zone closest to the goal with the aim of scoring in the goal of the opponents. The guidelines of this tactical principle are to overtake direct opponents and unbalance their defensive organisation in order to bring the ball to a favourable position in the score zone (near enough to increase the accuracy of the shot and far enough to avoid being tackled by the opponents). Progress with the ball is made by trying to approximate the position of the attacker to the goal or overtaking the direct opponent and trying to take advantage of this by creating space to play or to perform actions that are characteristic of the penetration principle.

The width and length (space) principle aims to extend and use a larger effective play space (Costa *et al*., 2010). By increasing the dispersion of the players during the offensive phase it will be easier to attract defensive players into non-vital zones (side-lines), removing them from the vital zone (the middle), thus trying to throw the defensive concentration of opposing team off balance. By removing some opposing defenders to non-vital areas, it will be possible to explore the central area of the score zone. Furthermore, it will be possible for the player with ball possession in the central area to attempt to overtake the direct opponent, benefiting from more space to conclude the offensive process successfully.

The offensive unit principle involves the positioning of off-ball defenders so as to decrease the effective play space of the opponents. To keep the collective cohesion and balance between team sectors it is important to have an effective and functional distribution of players in relation to the ball position, the phase and match status of the game, and the positioning of the opponents. Thus, the team needs to function as a whole, positioning itself functionally on the field. The fundamental guideline for this principle is the efficient positioning of players on the field, which not only takes into account the individual missions of the players, but also to consider the collective objective and functionality of the team as a whole (Castelo, 1996). The offensive unit principle assumes a balance between the sectors (defenders, midfielders, forwards) of the team as a determining factor for success when the team loses possession of the ball. By maintaining the proximity between the team sectors and a balanced organisation, it will be easier to move to the defensive organisation (Teodorescu, 1984), thus increasing the opportunities to improve the quality of the defensive action. The ultimate goal is not to unbalance the team at any stage of the game.

RESEARCH PROBLEM

These tactical principles have been observed using manual and semi-automated methods. The manual system depends totally on a human operator who controls and records the necessary data, whereas the semi-automated system assists the human operator to collect, store and treat the data. Nevertheless, the human operator has a preponderant influence during all these processes. From these systems, it is possible to identify: tactical performances of players; network analysis of team mates; and *t*-patterns of collective interactions. Such an analysis can be used in any situation and requires only the software and the video-recording of a match. Any coach or analyst can thus use such a system to observe the behaviour of a team, even an

amateur team. The great amount of time spent on observation is, however, a disadvantage. Online observation (during a game) is also very difficult due to the complexity of data recording and processing. Despite the many advantages that football teams can gain from these systems, the technique is under-used and will remain that way until a fast, automated and user-friendly system is developed.

Therefore, the aim of this study was to propose a computational method to analyse the penetration (width and length) and offensive unit principles of play during football matches. These metrics will be computed using kinematic information about the positioning of players on a Cartesian field. This automated analysis will allow a step forward in increasing the speed at which analysis can be undertaken and thus its usefulness for coaches during and after matches.

METHODS

Sample

Three official home matches of a professional team were analysed. At each match the final score was different: winning; losing; and drawing. Thus, each of the matches was considered according to its final score. All of the collected data complied with the ethical standards for the treatment of human or animal subjects of the American Psychological Association.

Data collection

The teams' actions were captured using a digital camera (*GoPro Hero* with 1280 x 960 resolution), with capacity to process images at 30Hz (30 frames per second). The camera was placed on an elevated surface above the ground in a way that would capture the whole field. The field dimensions were 104 x 68hm. After recording the football match, the physical space was calibrated using direct linear transformation (DLT), which measures the position of the elements (players and ball) in pixels to the metric space (Abdel-Aziz & Karara, 1971).

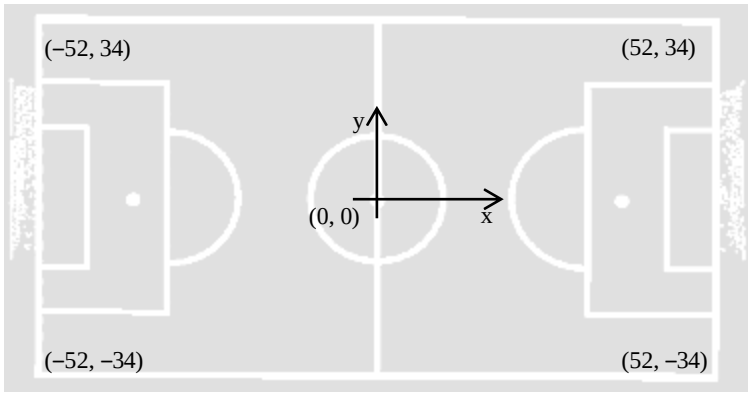


FIGURE 1. **FOOTBALL REFERENTIAL FIELD**

The tracking of the players was accomplished after the calibration, which returned the virtual coordinates into real coordinates per each second, thus providing the Cartesian (x and y) position of players during the match (Figure 1). The whole process associated with this approach (detection and identification of trajectories of players, space transformation and

computation of metrics), was performed using the *MatLab* (versionR2013) software. By using this software, it was possible to analyse the data, develop algorithms and create models and applications for this particular study.

For the sake of efficiency, only the time when the ball was in play was considered and all moments when the ball was not in the field (out of bounds) were excluded from the analysis. Since the methodology proposed here has some computational complexity, each second corresponded to an analysed instant for each player and the ball. From the 3 matches, 9218 instants were collected.

Computing the offensive tactical principles

The first concept that had to be developed was the offensive zone definition (ODZ). This concept comes from Costa *et al.* (2009), and consists of the development of a circumference of 5m radius around the ball. Using the centre-of-game, it is possible to identify the closest and farthest players from the ball and the zone of definition. From all this information, a set of metrics can be computed based on the indicators that characterise the effectiveness of the offensive principles of play.

Penetration metric

Two main indicators were used to evaluate the effectiveness of the tactical principle of the penetration metric:

1. The centre-of-game must maintain forward movement at each second, thus the centre-of-game should move to a forward position compared to the immediate previous position.
2. The numeric relationship between the team mates and opponents should not be an inferior one; thus, if the position is 2 against 2 (equality) in the centre-of-game, the next movement cannot pass to a numeric disadvantage (Figure 2).

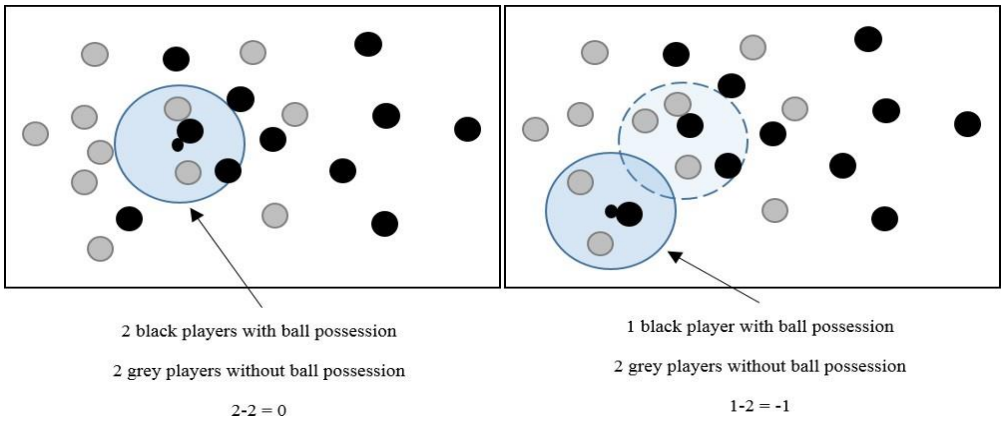


FIGURE 2. **CENTRE-OF-GAME MOVEMENT: EXAMPLE OF NON-PENETRATION EFFECTIVENESS**

Note: The blue circle represents a 5m radius around the ball. A solid line represents the current ball location and a dotted line represents the previous position.

From the effectiveness calculation, the numeric relationship during the match can be analysed, identifying the evolution of better, equal or worse numeric situations. Moreover, from the relative metric the effective penetration ratio can be computed:

$$P = Number\ of\ effective\ penetrations$$

$$r \quad \frac{}{Number\ of\ ODZ} \tag{1}$$

This ratio is developed at each iteration and, therefore, it is cumulative.

Width and length offensive principle

The width and length principle depends on the exploitation of all the spaces in the field in order to expand the playing space and create new opportunities to perform the attack (Figure 3). Therefore, two criteria were defined for considering the effectiveness of this tactical principle:

1. At least one forward player performs the mobility principle (the movement of players between the last defender and the goal line (Costa *et al*., 2010). When one team mate offers a line of pass in proximity to the last opposition defender, this will be considered as effective attacking depth mobility. This proximity will be considered as the 5m behind the line of the last opposition defender (considering the x-axis).
2. At least one player who does not perform the mobility principle moves to the position out of the opponents' surface area on the lateral axis (width).

Width

Surface area of defenders

Line of opponents' width

Goalkeeper

Goalkeeper

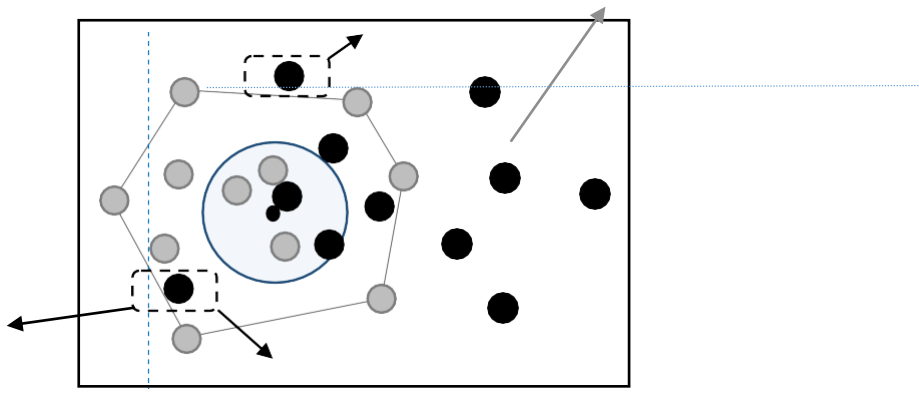
5m behind the line of last opposing defender

Length

FIGURE 3. **EXAMPLE OF WIDTH AND LENGTH EFFECTIVE MOVEMENTS**

By using this metric, the ratio of the effective width and length principle of play can be computed:

$$WL_r$$



$$= \frac{Number\ of\ width\ and\ length}{Number\ of\ ODZ}$$

(6)

The width and length principle is an extremely important one in play that brings about the expansion of offensive moments by ensuring opportunities to avoid the penetration of the midfield where there are more opposing players. Therefore, the ratio of width and length allows the identification of how the team applies this principle during offensive play.

Offensive unit

The offensive unit was measured using 2 main criteria:

1. Only the players behind the ball's longitudinal line will be considered in this metric.
2. At least half of the players behind the line of the ball always move in synchrony with the ball's trajectory on at least one axis (Figure 4), i.e. if the ball moves to the right and forward, then the player needs to move right or forward.

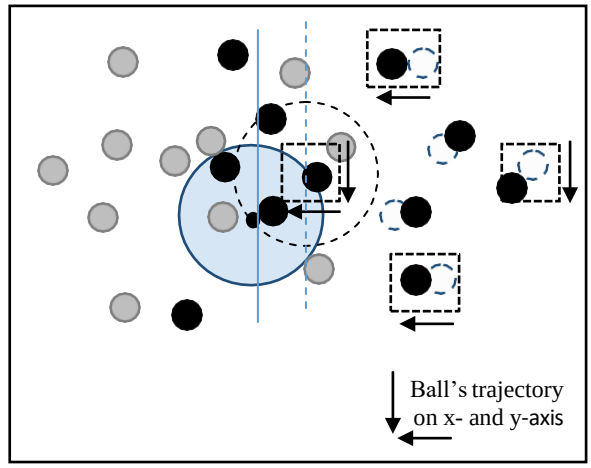


FIGURE 4. **EXAMPLE OF EFFECTIVE OFFENSIVE UNIT**
[Offensive unit following the ball's trajectory once the ball has changed location, forward (in the longitudinal axis) and down (to the middle) on the pitch.]

NOTE: Large solid-line circle = Position of the centre of the game
Large dashed-line circle = Previous positions of the centre of the game
Small dashed-line circle = Previous positions of players
Arrows = Direction change in ball position
Solid vertical line = Current line of ball Dashed vertical line = Previous line of ball

By using this metric, it was possible to count for each offensive play the number of players moving in synchrony with the ball's trajectory and the relative frequency. Moreover, it was possible to develop the following offensive unit ratio:

OU_r

$$= \frac{Number\ of\ offensive\ unit}{Number\ of\ ODZ}$$

(7)

This ratio indicates whether the players behind the line of the ball move in synchrony with the ball's trajectories and the centre-of-game. This is very important in preventing the eventual loss of the ball, as well as in giving a closer line of pass to team mates with ball possession.

Statistical procedures

For the descriptive analysis the mean values, standard deviation, minimum and maximum values, and the coefficient of variation were determined. The classification of dispersion using the coefficient of variation was performed using the following scale (Pestana & Gageiro, 2008:114):

Coefficient of variation (%)	Classification of dispersion level
0–15	Low dispersion
15–30	Moderate dispersion
≥30	High dispersion

The box plots for each principle of play were also presented. All statistical procedures were computed in the SPSS statistics software (version 21).

RESULTS

Descriptive statistics were used to inspect the results for the 3 tactical principles. The data on the 3 case-study matches were organised by each half, thus resulting in 6 variables: M1H1 (Match 1 and Half 1), M1H2, M2H1, M2H2, M3H1 and M3H2. Despite this procedure, no statistical differences were found between matches. As can be seen in Table 1, the mean values of the ***penetration*** principle were around 0.42±0.13. The mean coefficient of variation, namely 32.03, was higher than 30%, which suggests a great degree of dispersion from play to play.

TABLE 1. **DESCRIPTIVE STATISTICS OF PENETRATION RATIO**

Variables	Mean±SD	% Coefficient of variation	Minimum	Maximum
M1H1	0.46±0.15	31.35	0.24	0.81
M1H2	0.39±0.12	29.84	0.16	0.65
M2H1	0.41±0.07	17.43	0.24	0.59
M2H2	0.41±0.15	36.82	0.12	0.75
M3H1	0.41±0.15	35.41	0.10	0.77
M3H2	0.42±0.13	32.31	0.11	0.71
Total	0.42±0.13	32.03	0.10	0.81

From the descriptive statistics for the ***offensive space*** principle (Table 2), it is evident that the mean ratio of the 3 matches was 0.80±0.24. It was also observed that the mean for each play ranged from 0.1 to 1 (the maximum). The coefficient of variation was higher than 30% for the majority of matches, suggesting a considerable level of dispersion. Nevertheless, no statistical differences were found between matches.

TABLE 2. **DESCRIPTIVE STATISTICS OF THE OFFENSIVE SPACE RATIO**

Variables	Mean±SD	%Coefficient of variation	Minimum	Maximum
M1H1	0.79±0.26	32.82	0.10	1
M1H2	0.72±0.26	35.90	0.18	1
M2H1	0.79±0.26	32.69	0.24	1
M2H2	0.88±0.15	17.27	0.45	1
M3H1	0.84±0.20	23.76	0.36	1
M3H2	0.76±0.29	38.75	0.12	1
Total	0.80±0.24	30.58	0.10	1

The result for the ***unity*** principle suggests that this was accomplished at a high level during the matches (Table 3). The mean value was 0.83±0.19 and the coefficient of variation showed a moderate dispersion of 23%. Nevertheless, no statistical differences were found between matches.

TABLE 3. **DESCRIPTIVE STATISTICS OF UNITY RATIO**

Variables	Mean±SD	% Coefficient of variation	Minimum	Maximum
M1H1	0.78±0.19	24.77	0.33	1
M1H2	0.83±0.20	24.13	0.33	1
M2H1	0.87±0.15	17.11	0.50	1
M2H2	0.77±0.22	27.91	0.18	1
M3H1	0.84±0.18	21.41	0.40	1
M3H2	0.87±0.19	21.21	0.41	1
Total	0.83±0.19	23.22	0.18	1

DISCUSSION

The first tactical principle that was inspected was penetration. The main aim of this principle is to ensure that the ball progressed in a forward movement in an attempt to disrupt the

defensive organisation of the opponents (Costa *et al*., 2009). To identify the success of this principle, the algorithm proposed considered the forward movement of the ball, as well as the non-deterioration of the numerical relationship with opponents inside the centre-of-game.

It was observed that the mean of the 3 analysed matches was 0.42, suggesting a low level of success. Such a result can be expected by the requirements imposed by this algorithm. In fact, the requirement to ensure the non-deterioration of the numerical relationship inside the centre-of-game reduces the possibilities for accomplishment, as it is natural for the density of defenders to increase as the ball progresses towards their defending goal. Therefore, if the team with the ball moves forward more opposing players will appear in the centre-of-game, thereby reducing the possible numerical advantage of the team with ball possession. In that sense, the possible higher values of this ratio can mean that the strategy of the team is to move the ball forward to areas without a great concentration of opponents, such as to the lateral sides (Dooley & Titz, 2011).

Another principle of play investigated in this case study was the offensive space (width and length). This principle offers the player with possession of the ball some options to take the ball from the middle zone, where there is more opponent pressure, to try to open the space to play at the lateral sides or closer to the last defensive line of opponents (Castelo, 1996). The aim of this principle is to reduce the concentration of opponents in their central zone, thus attempting to open up some spaces to penetrate between the opposing players (Trapattoni, 1999).

A high mean value was observed for the accomplishment of this principle. The ratio of 0.80 for the 3 matches suggests that team mates attempted to ensure this principle during the offensive process. In this case study, the team used 2 forward wings, making it is easier to accomplish this principle because of the strategic position of the 2 players playing in the wings. In other cases, such as the diamond 1-4-4-2, there are not 2 fixed players in the forward wings, thus, it is possible that the space ratio may be smaller than in this specific case. In that sense, it would be interesting in future studies to compare different teams that used different player strategic distributions on the field.

The last principle of play investigated in this case study was that of offensive unity. This principle aims to ensure that there is a reduced space between the different lines of the team (defensive, midfield, forward), thus providing greater and closer support to the player with ball possession. Furthermore, offensive unity ensures that in the case of the loss of the ball, the reduced spaces between the lines will immediately put pressure on the opposing team (Costa *et al*., 2009). Both objectives are very important for increasing the possibilities of success in collective action.

In this case study it was possible to observe a mean of 0.83 in the ratio for offensive unity. Such a result suggests a high degree of synchronisation between team mates following the ball location during the offensive process. The accomplishment of this tactical principle is

very important for any strategy adopted by a team. The capability to move players in a synchronised way is essential for improving the collective behaviour and for playing as a team. It is very important that further studies be undertaken on a large sample and on different teams to help us understand how team mates synchronise their movements to achieve the unity principle during the offensive process.

Furthermore, a set of 3 tactical metrics were proposed and their respective ratios measured the tactical behaviour in the offensive processes. By using the Cartesian information about the positions of players and the ball, it was possible to develop automatic metrics that provided information about tactical behaviour. Such metrics mean a step forward to an easier and quicker match analysis process, reducing the time spent by human operators. It was not possible to generalise the results of this case study. Future research should compare a larger sample of teams and matches to investigate differences from team for team. Furthermore, future studies could be expected to identify some of the specific characteristics of each team using these tactical metrics. It would be very important to cross match the information about these tactical metrics with other indicators of match analysis, such as notational analysis and spatio-temporal analysis.

PRACTICAL APPLICATION

Novel estimation, detection and identification techniques have been applied to sport, resulting in the Cartesian positional information of players over time. This information has been considered vital within the sport science literature as it proposes new computational tactical metrics that may allow the investigation of the spatio-temporal relationship between team mates. Such technological approaches can improve the understanding of the collective match, providing coaches and analysts with a real-time augmented perception of the game.

It is suggested that all these new technological metrics need to be understood by a great range of coaches and analysts. A user-friendly system must be the essence of such metrics. Moreover, the opportunity to collect simple and pertinent information should be taken into account for the system to be generalised for the whole football community. There must be a threshold between the complexity of such metrics and the applicability of information for coaches and analysts.

These metrics have a valuable strength in comparison with the semi-automated systems. The use of an integrated system that is totally autonomous from the data retrieval to the data processing makes the use of such analyses possible during official matches or even in daily training sessions without a great effort on the part of a human operator. Nevertheless, one main issue can be mentioned. The system depends on an automatic tracking method that is now too expensive for amateur or even some professional teams. Thus, the tracking method must be prioritised in an integrated system. A solution, such as a single camera or even a low-cost GPS with heart rate monitor, must be considered to reduce the possible costs of such a match analysis system.

To enhance the coaches' visualisation, it is possible to discuss the introduction of Augmented Reality (AR), during daily sessions and games. The possibilities of information provided in real time can actually increase the optimisation of training sessions. From the individual data

about physiological responses, time-motion profiles and individual technique of players, to the whole real-time picture about the collective organisation, the possibilities of applying AR to enhance coaches' perceptions are massive. However, it is noteworthy that the available information will always depend on the number of devices and data collected during training sessions and matches.

About this proposal, only in April 2014 it was possible to observe the first system that used the AR glasses during a match. This happened in Spain, in the game Getafe vs Atletico Madrid. With this first trial only notational analyses were visualised. Thus, the natural evolution is the introduction of new collective metrics to analyse the interaction between team mates during the match.

CONCLUSION

In this case study three metrics and ratios were proposed to investigate and estimate the tactical behaviour of football teams. Three automated metrics were developed that were derived from the Cartesian players' positions on the field: penetration; width; and length and unity. From the results it was possible to identify that the highest ratio was achieved for the unity principle in play and the lowest ratio was observed in the penetration ratio. Nevertheless, due to the limited amount of data general conclusions cannot be drawn. Further studies need to be conducted involving an increased number of matches for analysis and comparing the influence of possession of the ball as well. Using current technologies, it would be possible to provide some automated solutions for the investigation of the performance of a team, thus providing new opportunities to develop match analysis systems.

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TRAINING HABITS, TRAINING SURFACE AND INJURIES AMONG SOUTH AFRICAN NETBALL PLAYERS

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ABSTRACT

Netball involves rapid acceleration, deceleration and directional changes exerting considerable force on articular and peri-articular structures, resulting in a high risk of injuries. Preventing injuries to the ankle and knee joints of netball players is of particular concern. Improvement in core stability, neuromuscular control (NMC) and biomechanics have been proven to reduce knee injuries within the sporting population. Improvement in proprioception is effective in reducing ankle injuries. Playing surfaces with higher friction values seem to elevate the rate of injuries. The aim of this study was to assess participation in preventative training modalities to reduce joint injuries that occur most frequently in a cohort of elite South African netball players (N=1280). The effect of the playing surface on injury rates was also assessed. Subjects participated in three elite netball tournaments in South Africa. By means of a questionnaire it was found that between 51.7% and 59% of injured netball players did no exercises to improve their core stability, NMC or proprioception. The cement playing surface delivered a 1.9 times higher injury rate than the synthetic surface. Netball coaches should be educated on the value and implementation of exercise modalities that could limit injuries to the ankle and knee joints of netball players.

Key words: Netball injuries; Injury prevention; Playing surface.

INTRODUCTION

Coaches throughout the world are increasingly pushing the limits of human adaptation and training loads with the aim of achieving top performances. Despite the benefits of scientific conditioning programmes, each sporting code has an inherent risk of injury (Smith *et al*., 2005). It is, therefore, important to understand the frequency and nature of sport injuries to assist in the development of effective injury prevention strategies. The role of any strength and conditioning/sport development coach is not only to get the sportsperson fit and ready to take the field of play, but also to prevent injuries. Proactive prevention of injuries is often neglected. Even elite netball coaches and teams with a scientific approach to the game have confessed to being reactive rather than proactive with regard to scientific strength and conditioning programmes and injury prevention (Elphinston & Hardman, 2006). Therefore, governing bodies should be aware of the epidemiological evidence of injury risk in sport and that effective preventative measures are available (Fuller & Drawer, 2004).

The majority of injuries sustained by netball players are to the lower limbs, specifically the ankle and knee joints (Hopper & Elliott, 1993; Hopper *et al*., 1995a; Hopper *et al*., 1995b; Smith *et al*., 2005; Ferreira & Spamer, 2010). Ligaments are the most commonly injured structures (Hume & Steele, 2000; Finch *et al*., 2002; McManus *et al*., 2006). Recurrent injuries to the ankle are common in this sporting population and it seems that knee injuries are quite severe. It is suspected that some netball players retire early from the sport because of serious knee injuries (Hopper *et al*., 1995a; Otago & Peake, 2007). In this regard, injuries to the anterior cruciate ligament (ACL) are of particular concern for netball players (Hopper *et al*., 1995b).

Injury prevention

Decreases in injury rates can be established through pro-active initiatives (Elphinston & Hardman, 2006). Even though improved techniques to rehabilitate sport injuries are

constantly being developed, it may be of greater importance to prevent injuries (Bahr & Holme, 2003). In an attempt to limit the amount of ACL injuries that are sustained by sportswomen, controllable contributing factors must be addressed (Ireland, 1999; Herrington, 2011). Researchers have investigated rule changes that could reduce ground reaction forces that would lead to a decrease in moment angles in the knee, which in turn lowers the risk of ACL injuries (Otago, 2004; Herrington, 2011). According to Yu and Garrett (2007), ACL injuries occur when excessive shear forces are applied to the ACL. A non-contact ACL injury occurs when poor movement patterns cause a sportsperson to place high enough forces or moments on the ligament that exceed the amount of tension it can sustain (Boden *et al*., 2010). Therefore, it is of crucial importance to understand how the ACL is loaded through movement and what the mechanisms and risks are for injury. Improvement of neuro-muscular control can limit the risk of knee injuries (Hewett *et al*., 1999; Myer *et al*., 2008). This is of particular importance due to high-risk manoeuvres, such as jumps and landings, quick acceleration and deceleration, and rotational movements that occur in netball (Ferreira & Spamer, 2010; Herrington, 2011).

Various authors place emphasis on the value of proprioceptive exercise as part of training programmes, as it has been shown to be valuable in limiting injuries of the lower extremities, especially in preventing injuries to the ankle joint (Bahr *et al*., 1997; Wedderkopp *et al*., 1999; Stasinopoulos, 2004; Verhagen *et al*., 2004; Emery *et al*., 2005). There is also evidence of the beneficial effects of improved core stability in the prevention of knee injuries (Kibler *et al*., 2006; Zazulak *et al*., 2007a).

The playing surface is an extrinsic factor that can play a major role in injury rates (Pasanen *et al*., 2008). The hardness and the surface-to-shoe interface resistance seem to be two factors that need to be considered in sport injuries. An increase in resistance of the interface seems to be a risk factor for traumatic injuries in sports that require rotational movements (Pasanen *et al*., 2008). Murphy *et al*. (2003) are of the opinion that the hardness of the surface can influence the ground reaction forces and can contribute to overloading of tissues, for example, bone, ligaments, muscle and tendons.

There is significant and consistent evidence in the literature to support the use of injury-prevention strategies in adolescents. These include pre-season conditioning, functional training and education, as well as strength and balance programmes that are continued throughout the playing season (Abernethy & Bleakley, 2007). It is, therefore, important to identify the causes and nature of sport injuries in netball and accordingly to introduce a proactive injury prevention programme in South African netball.

Epidemiology of netball injuries

The research reported in this article is part of a larger study. The purpose of the first study (Langeveld *et al*., 2012) was to determine the epidemiology of injuries at the national u/19 and u/21 tournaments of University Sport of South Africa (USSA) and the national senior championships in 2009. The results of that particular study showed a high incidence of 500.7 injuries per 1000 playing hours. Most injuries occurred to the ankle joint (34%), followed by the knee (18%), fingers, hand and wrist (15% each). Ligaments were the most commonly injured structures. However, the majority of injuries were minor in terms of game time lost in the tournament (Langeveld *et al*., 2012).

RESEARCH PROBLEM

The purpose of this part of the study was to identify injury trends and possible associated factors at these tournaments, to compare it with available literature and finally to make suggestions for interventions to limit the amount of injuries sustained by netball players. Firstly, the goal of this study was to assess the amount of time that South African netball players spend on modalities, such as core training, neuromuscular control (NMC) and biomechanics, proprioception and flexibility as part of their conditioning. Secondly, the goal was to assess the influence of the playing surface on the injuries sustained by netball players.

METHODOLOGY

Sample

The study population included all the participants (N=1280) in the 2009 USSA national u/19 and u/21 tournaments and the 2009 national senior championships. A total of 205 injuries were sustained by 192 players. At each tournament, teams competed in a Round-Robin format over 4 to 6 days. The top 4 teams in each section played semi-final and final knockout matches to determine the winner of each tournament. Each team played 1 or 2 games per day.

Questionnaire

A questionnaire was used to collect data on all injuries and training modalities. After scrutiny of various injury surveillance questionnaires and definitions of injuries, the questionnaire was based on one that was drafted by the Rugby Injury Consensus Group to monitor the epidemiology of rugby injuries (Orchard *et al*., 2005; Fuller *et al*., 2006; Fuller *et al*., 2007; Pluim *et al*., 2009). It was adapted by the researchers to address the aims of this study and to standardise definitions of injury. A section on training history was added to examine the use of evidence-based preventative training modalities. This section consist of 5 training modalities, namely: core stability; flexibility; proprioceptive exercises; neuro-muscular control; and biomechanics (improved landing technique). The player had to indicate the amount and duration of sessions per week spent on these training modalities.

Informed consent was obtained from Netball South Africa, the event organisers and players. Ethical clearance was also acquired from the Ethics Committee of the University of the Free State to undertake this study (UFS-HUM-2014-35).

Questions were only posed to injured players. Team managers, coaches and medical staff were instructed on how to complete the questionnaire. Team managers and medical staff were responsible to ensure that each injured player completed a questionnaire, assisted by the primary researcher. The primary questionnaire supervisor of each team was trained by the primary researcher to ensure that they and the injured players understood the meaning of each question. In the event of uncertainty, the primary researcher could be called for assistance. Completed questionnaires were collected daily at a scheduled meeting for managers at the adjournment of each day's play. With this procedure, reasonable measures were put in place to ensure that all data on injuries sustained at these tournaments were collected in keeping with the accepted method of data collection of Hopper and Elliot (1993) and Hopper *et al*. (1995a).

Statistical analysis and interpretation of data

All data was electronically captured in Microsoft Excel 2007. The SAS version 9.1.3 statistical software was used for the further analysis of data. Means and standard deviations or medians and percentiles were calculated for numeric data. Frequencies and percentages were calculated for categorical data.

RESULTS AND DISCUSSION

Injury profile

A total of 1280 players who participated in 447 games at 3 netball tournaments were included in the study. A total of 192 players sustained 205 injuries, representing 15% of players who sustained 1 or more injuries. Acute injuries represented 91% of the injuries, while 8.8% of the injuries were recurrent or chronic in nature. Ninety-five per cent (95%) of the injuries were sustained during matches played at these tournaments, while 3% were sustained during warm-up and 2% during practice sessions. In 60.8% of the cases, physical contact with another player led to the injury (Langeveld *et al*., 2012). Factors associated with injuries included tournament play and previous injury, as well as lack of core stability and lack of neuro-muscular and proprioceptive training (Langeveld *et al*., 2012).

Participating in core stability training sessions

Table 1 specifies the participation in core stability training sessions. There is evidence in the literature that suggests that improvement in core stability has the advantage of limiting sport injuries, specifically regarding knee injuries (Kibler *et al*., 2006; Zazulak *et al*., 2007a; Zazulak *et al*., 2007b). With this in mind it is disturbing to note that more than half (51.7%) of injured players made no attempt to improve their core stability.

TABLE 1. **CORE STABILITY: PARTICIPATION IN TRAINING SESSIONS**

Sessions per week	Frequency	Percentage	Cumulative frequency	Cumulative percentage
0	104	51.74	102	51.74
1	21	10.45	125	62.19
2	26	17.91	161	80.10
3	18	8.96	179	89.05
4	11	5.47	190	94.53
5	11	5.47	201	100.00

Participation in neuromuscular control (NMC) and biomechanical training sessions

Table 2 summarises the participation in NMC and biomechanical training sessions by the injured netball players. It is clear from epidemiological studies that an incorrect landing technique was one of the main contributing factors in ankle and knee injuries (Hopper & Elliot, 1993; Hopper *et al*., 1995a; Hopper *et al*., 1995b; Hume & Steele, 2000; Walker, 2010; Herrington, 2011). There is also increasing evidence in the literature indicating that improvement in NMC and biomechanics contribute to injury prevention (McLean *et al*., 2004; McLean *et al*., 2005; Yu *et al*., 2006; Powers, 2007; Walker, 2010; Herrington, 2011). Despite the high rate of injuries in netball (Hopper & Elliot, 1993; Hume & Steele, 2000; Otago & Peake, 2007), alarmingly more than half (57.7%) of the injured players in the current study indicated that they do not participate in exercise sessions to improve NMC and biomechanics (improved landing technique).

TABLE 2. **NMC AND BIOMECHANICAL: PARTICIPATION IN TRAINING SESSIONS**

Sessions per week	Frequency	Percentage	Cumulative frequency	Cumulative percentage

0	116	57.71	116	57.71
1	13	6.47	129	64.18
2	30	14.93	159	79.10
3	22	10.95	181	90.05
4	12	5.97	193	96.02
5	8	3.98	201	100.00

According to Chaudhari and Andriacchi (2006), the high incidence of non-contact ACL injuries is undoubtedly a problem along with many contributing factors, including biomechanical factors. Therefore, it is presumed that mechanical aspects, such as dynamic alignment and joint stability of a weight-bearing limb, play a crucial role in the prediction of injuries. Faulty biomechanics in the sagittal plane was suspected to be the main contributing factor to non-contact ACL injuries (Yu & Garrett, 2007). This is in conflict with other evidence that suggests that loading in the sagittal plane places a ceiling on the forces contributing to ACL loading and that valgus forces are more likely to be a causative factor of ACL injuries in sportswomen (McLean *et al*., 2004). According to McLean *et al*. (2005), it is important to limit knee valgus moments in sporting activities to reduce ACL injuries. These authors also advise improved NMC at the hip to limit knee valgus angles during a cutting movement. This is of particular importance for sportswomen (McLean *et al*., 2005).

According to Powers (2003), knee valgus occurs because of femoral adduction (relative to the pelvis), tibial abduction (relative to the femur), or a combination of both. Excessive femoral adduction during dynamic activities can occur because of weak hip abductors, particularly the gluteus medius. Yu *et al*. (2006) also indicated how hip movement can contribute to ACL loading. Electromyography studies show that during a squat performed in a hip dominant position (knees behind the toes), muscle activity in the knee extensors decrease as compared

to a quad dominant position (knees over the toes), which decreases the load on the ACL (Powers, 2007). It is, therefore, of utmost importance to ensure that sportspersons competing in events where jumps and landing are part of the game are trained to optimise their NMC and biomechanics.

Participation in proprioceptive training sessions

There are again various authors who place emphasis on the value of proprioceptive exercise as part of the training programme, seeing that it has been shown to be valuable in limiting injuries to the lower extremities, especially to the ankle joint (Bahr *et al*., 1997; Wedderkopp *et al*., 1999; Stasinopoulos, 2004; Verhagen *et al*., 2004; Emery *et al*., 2005). Again, despite overwhelming evidence of the value of proprioceptive training, 59% of the injured players in this study made no attempt to improve this component during their physical preparation (Table 3). It is important to note that these underutilised modalities are preventative and remedial for the injuries (ankle and knee joint) that occur most frequently in netball players (Hume & Steele, 2000).

TABLE 3. **PROPRIOCEPTIVE: PARTICIPATION IN TRAINING SESSIONS**

Sessions per week	Frequency	Percentage	Cumulative frequency	Cumulative percentage

0	119	59.00	119	59.20
1	16	7.96	135	67.16
2	27	13.43	162	80.60
3	20	9.95	182	90.55
4	8	3.98	190	94.53
5	11	5.47	201	100.00

Participation in flexibility training sessions

Table 4 summarises the participation of netball players in flexibility training sessions. Flexibility is the one component which the majority of netball players worked at diligently, with 64.2% of all injured players participating in between 3 and 5 sessions per week. This is the case despite the fact that flexibility is the one component where there is no clear evidence to suggest that it has a positive role to play in the prevention of injuries (Thacker *et al*., 1999; De Noronha *et al*., 2006).

TABLE 4. **FLEXIBILITY: PARTICIPATION IN TRAINING SESSIONS**

Sessions per week	Frequency	Percentage	Cumulative frequency	Cumulative percentage
0	9	4.48	9	4.48
1	7	3.48	16	7.96
2	56	27.86	72	35.82
3	46	22.89	118	58.71
4	42	20.90	160	79.60
5	41	20.40	201	100.00

It is the responsibility of the coach to ensure that time is set aside to incorporate exercises in the training programme that improve not only flexibility, but also core stability, NMC and biomechanics (improved landing technique), as well as proprioception. Enlightening coaches about the value of these components by means of coaching courses could be of great value and a positive step towards injury prevention (Gianotti *et al*., 2010; Saunders *et al*., 2010).

Playing surface

At the South African senior championships the games were played on cement courts (54 hours), as well as on a synthetic indoor surface (77 hours). Even though the majority of games were not played on cement surfaces, 500 injuries per 1000 playing hours occurred on cement surfaces, while only 260 injuries per 1000 playing hours occurred on synthetic surfaces. This represents a 1.9 times higher injury rate on cement surfaces than on synthetic surfaces. The current results also indicate that 148 knee injuries per 1000 playing hours (80%) occurred on the cement surface compared to only 26 knee injuries per 1000 playing hours (20%) on the synthetic surface. Furthermore, the majority (88.9%) of serious injuries resulting in players being out of action for more than 7 days, occurred on the cement surface.

One study to compare injury rates on different surfaces in a similar sport is that of Pasanen *et al*. (2008), who found the incidence of injury on artificial surfaces in Finnish floorball to be 2.2 times higher than on wooden flooring that causes less friction. This highlights the

importance of the playing surface in injury prevention. The main contributing factors that influence the risk of injury on different playing surfaces seem to be the hardness of the surface and the amount of friction of the footwear-surface interface. Increased hardness of the surface caused increased ground reaction forces, which could contribute to increased loading and fatigue of bone and soft tissues (Murphy *et al*., 2003; Otago, 2004; Herrington, 2011). A higher injury risk is associated with high amounts of friction between footwear and playing surface in sport where weight-bearing rotational movements are common (Pasanen *et al*., 2008). The increased friction may contribute to increased shearing forces around the knee, which puts the ACL at risk (Yu & Garrett, 2007).

CONCLUSION AND RECOMMENDATIONS

Out of a total of 1280 players participating in 447 games at the three netball tournaments, 192 players sustained 205 injuries. This is equal to 15% of the players sustaining one or more injuries.

This injury surveillance study reported a high incidence of injuries among elite netball players in South Africa and revealed factors possibly associated with injuries. A surprising underutilisation of evidence-based preventative strategies has been identified. Based on the results of this study, the following conclusions and recommendations seem warranted:

- Netball coaches must be educated on the value of improved core stability, neuro-muscular control (NMC), biomechanics and proprioception. Coaches are strategically placed to have an impact on injury rates and to prevent the trends of recurring ankle injuries.

- The majority of netball games in South Africa are played on cement surfaces. Because of the high injury rate on these surfaces, creative ways need to be found to reduce ground reaction forces and resistance of footwear-surface interface. Further research in this regard may contribute greatly to the reduction of injury rates in netball and should be actively promoted.
- Future epidemiological studies will have to assess the efficacy of intervention programmes.

If these factors are addressed and their effects monitored, a positive contribution could be made to the prevention of netball injuries.

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SPORT STACKING MOTOR INTERVENTION PROGRAMME FOR CHILDREN WITH DEVELOPMENTAL COORDINATION DISORDER

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ABSTRACT

The purpose of this study was to explore sport stacking as an alternative intervention approach with typically developing children and in addition to improve DCD. Sport stacking consists of participants stacking and unstacking 12 specially designed plastic cups in predetermined sequences in as little time as possible. Eighteen children (6 girls and 12 boys) classified with DCD, between the ages of 6 and 7 years, participated. A pre-test/post-test quasi-experimental design with a control group was applied. The Movement Assessment Battery for Children-2 (MABC-2) was used to assess the motor proficiency levels of the children and to classify DCD. The sport stacking intervention consisted of an 8-week programme of 3 sessions per week, 30 minutes per session. During the intervention the children learned the various sport stacking sequences, as well as how to apply them to a variety of physical activities. The results indicate that prior to the intervention no significant differences occurred between the 2 groups. After the intervention, manual dexterity and balance showed a significant difference, while aiming and catching, showed no significant difference. The total test score revealed a significant difference in the overall motor proficiency levels of the experimental group. The results suggest that sport stacking can be used as an effective intervention programme for children with DCD.

Key words: Sport stacking; Motor proficiency; Developmental coordination

disorder; Intervention; Movement Assessment Battery for Children-2.

INTRODUCTION

Developmental coordination disorder (DCD) is a neuro-developmental disorder, causing marked impairment in the maturation of motor coordination (Polatajko & Cantin, 2006). According to Missiuna *et al.* (2006), children with DCD experience significant difficulties in motor learning and in the execution of functional motor tasks that are pivotal for success in their everyday lives. A large number of school-aged children have been identified with motor proficiency problems. These problems have substantial negative effects on their ability to participate fully in daily activities at home, school and in normal play (Polatajko & Cantin, 2006).

Even though children will not outgrow this disorder as previously believed (Henderson & Henderson, 2002), children can be facilitated by means of Barnett's V-step assessment process for the identification of children with motor problems (Barnett, 2008). The first step focus on the use of questionnaires for the screening and identification of children with motor problems. The second entails the use of norm-referenced tests for measuring the motor performance of the child. The third step of this motor assessment process entails the making of a formal diagnosis of DCD. This is served by measuring the qualitative and quantitative performance in motor tasks. The fourth step focus on understanding the nature of the condition. Finally, the fifth step is the planning of an intervention programme.

It follows that intervention programmes are a vital element of the assessment process in order to improve DCD. Researchers conventionally made use of bottom-up approaches by means of sensory integration and perceptual motor training in children with DCD (Bernie & Rodger, 2004; Sugden *et al*., 2008). These approaches aim to improve children's processing abilities or performance components and are still being practised as an intervention by many therapists (Missiuna *et al*., 2006; Sugden *et al*., 2008). According to Hamilton (2002), the most frequently used approaches are perceptual-motor therapy, sensory-integration therapy and kinesthetic training. All of these more often produced positive results than not.

Due to a lack of support for the bottom-up approach, new approaches emerged known as the cognitive or top-down approach (Bernie & Rodger; 2004). More researchers are in favour of this approach (Sugden *et al*., 2008). These new approaches were based on theoretical concepts of motor learning and cognition. Motor learning is based on a conscious understanding of the processes involved when a motor problem needs to be solved. Thus, the interaction between the task and environment, as well as the child needs to be taken into consideration (Perry, 1998). Cognitive approaches use direct skill teaching, but differ in the sense of the unique problem-solving framework, attempting to help children generalise from the learning of one skill to the next (Missiuna *et al*., 2006).

According to Missiuna *et al.* (2006) and Sugden *et al.* (2008), although the task-specific approach aims at increasing various participations for children, it is preferable to consider how children can perform a specific task in a variety of real-life situations, rather than in one specific setting. Consequently, one should consider how to modify the task or to adapt the environment in order for children to participate and improve their learning capabilities.

Sugden and Chambers (1998) proposed that most interventions are successful with a good number of children diagnosed with DCD. This statement was supported by findings from the same authors (Sugden & Chambers, 2003), observing that interventions done by parents and teachers can also be successful. The researchers found that a 7-week intervention (task-orientated approach), conducted by parents and teachers helped the majority of children to obtain scores above the 15th percentile. Miyahara *et al*. (2008) made use of university students in a clinical setting to apply a task-orientated approach and found that 40% of the participants improved beyond the cut-off scores. Intervention by means of a combination of the bottom-up and top-down approaches through intense physical activity conducted by Watemberg *et al*. (2007), concluded that 50% of the participants with DCD scored above the cut-off scores (>15th percentile) after a 4-week intervention.

It is clear that controversies exist between these different approaches and there is still not enough evidence to substantiate that one specific intervention approach is superior to another (Miller *et al*., 2001; Miyahara *et al*., 2008). It is thus proposed that these two approaches

(bottom-up and top-down) should be merged in order to care for children with DCD (Peters & Wright, 1999; Davidson & Williams, 2000).

Sport stacking was launched in a South African setting in January 2009. Sport stacking is already recognised as a sport by more than 18 nations, including Australia and Germany in addition to South Africa (Krog, 2008). According to the World Sport Stacking Association (2009), sport stacking is defined as a sport where 12 specialised cups are used to build formations. A participant is called a stacker. Stackers must stack cups in predetermined sequences, competing against the clock or another player (Gibbons *et al*., 2007). Sport stacking can, therefore, be used as an innovative and exciting way of improving motor proficiency, such as hand-eye coordination, ambidexterity, speed and concentration while having fun (Udermann *et al*., 2004; Krog, 2008).

RESEARCH PROBLEM

The aim of this study was to explore the effectiveness of sport stacking as an alternative intervention approach for typically developing children and in addition to improve DCD in children.

According to Aparo (2009:ii): *"*Sport stacking seems to improve, in a fun and challenging way, several rudimentary fine motor skills, such as hand-eye coordination, which is assessed in this study, and others such as bimanual coordination, ambidexterity, reaction time, concentration and quickness".

This study explores the efficacy of a cup stacking intervention for children classified with DCD in order to improve their motor proficiency levels.

MATERIAL AND METHODS

Study design

A pre-test/post-test quasi-experimental design with a control group was applied as an empirical study, which made use of quantitative data. The study involved a pre-test in order

to identify the children with motor difficulties, in other words DCD. The children were tested at their school by Kinderkineticists in-training who were familiar with the testing procedures of the relevant instrument. Each Kinderkineticist in-training was responsible for one subtest in order to have consistency across the study.

The children classified with DCD were divided into 2 groups. The experimental group took part in an 8-week intervention programme (sport stacking) comprising 30-minute group sessions 3 times a week. The reason for the 8-week intervention instead of the prescribed 12-week intervention is due to the fact that a school term consists of only 10 consecutive weeks. The Kinderkineticists were trained by professionals from a Speed Stacking company in order to execute the intervention programme accordingly. The speed stacking intervention was combined with various fundamental movements, such as locomotor-, manipulation-, as well as stability skills. A post-test, using the same procedure as the pre-test, took place after the intervention process in order to observe any improvement.

Participants

The participants were selected from a primary school in Bloemfontein, Free State province, South Africa, and therefore, constitute a convenient sample. Eighteen children between the ages of 6 and 7 years took part in this study. The group consisted of girls (n=6) and boys (n=12) classified with DCD.

Ethical considerations

The Department of Education, as well as the principal of the school granted permission for the research to be conducted on the school premises during the Life Orientation class periods. Approval had been obtained from the Ethics Committee of the Faculty of Health Sciences (ECUFS57/2012) of the University of the Free State. The parents of the participants completed an informed consent form for each child participating in this study. All children in the identified classes were considered for inclusion in the study. Exclusion criteria included a child in the age group outside the expected range of 6 to 7 years, where parental permission was not obtained or the informed consent form had not been completed fully or where parents had indicated that they would be relocating during the study.

Measuring instrument

The *Movement Assessment Battery for Children-2* (Movement ABC-2) is a standardised test and requires children to perform a series of motor tasks in a specified manner. In addition to age-related norms, the test also provides qualitative information on how children approach and perform the tasks. The Movement ABC-2 assesses the subject's motor proficiency levels and classifies children with DCD. The first assessment component of this test battery contains a total of 24 items organised into 3 sets of 8 tasks. Each set is designed for use with children of a different age band. The 8 tasks are grouped under 3 categories, namely manual dexterity (MD), balance (B) and aiming and catching (AC) (Henderson *et al*., 2007). Age-adjusted standard scores and percentiles are provided, as well as a total score based on each of the 3 components of the test. The total test score can be interpreted in terms of a 'traffic light' system. The green zone indicates performance in a normal range (>15th percentile), while the amber zone indicates a child as being at risk and needing to be carefully monitored (5th to 15th percentile). The red zone is an indication of definite motor impairment (≤5th percentile).

Analysis of data

Analysis of the data was completed by a Bio-statistician using Statistical Analysis Software Version 9.1.3. Descriptive statistics, namely frequencies and percentages, were calculated for categorical data. Medians and percentiles were calculated for numerical data. Median differences were tested by calculating p-values using the signed-rank test. The chi-square was used to test for proportional differences. A significance level of 0.05 was accepted for all aspects of the study.

RESULTS

The sample consisted of 18 children, of which 8 formed the control group and 10 the intervention group. With regard to gender the control group consisted of 2 girls (25%) and 6

boys (75%) and the intervention group consisted of 4 girls (40%) and 6 (60%) boys. There was no significant difference, (p=0.6380) between the 2 groups at the start. Table 1 presents the numerical data to compare the 2 groups regarding the pre-test median results of the various subtests of the Movement ABC-2

TABLE 1. **MEDIAN RESULTS OF TWO GROUPS: COMPARISON OF PRE- AND POST-TEST**

		Control group		**Experimental group**		**p-Value**	
Variables	**n**	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
MD	18	1.5	1.0	1.5	5.0	0.7832	0.0191
AC	18	25.0	50.0	25.0	69.0	0.6732	0.0734
B	18	20.5	7.0	37.0	20.5	0.2595	0.0472
TTS	18	5.0	2.0	9.0	12.5	0.1784	0.0018

MD= Manual Dexterity AC= Aiming and Catching B= Balance TTS= Total Test Score

It is clear from median results for the pre-test of the control and intervention groups that there was no significant difference between the 2 groups before the intervention commenced with regard to the various subtests, namely manual dexterity (p=0.7832), aiming and catching (p=0.6732), balance (p=0.2595) and the total test score (p=0.1784).

Manual dexterity involves the coordinated use of the hands, guided by the visual system, within time limits (Henderson *et al*., 2007). The pre-test median for the control group was 1.5 and the post-test showed a slight decrease to 1.0. For the intervention group, the pre-test was 1.5 and increased to 5.0. A significant difference (p=0.0191) was found between the 2 groups after the intervention was completed.

Aiming and catching entails coordinating body movements when receiving moving objects, as well as performing throwing tasks accurately (Henderson *et al*., 2007). The pre-test median score for the control group was 25.0 and this improved to 50.0 in the post-test. With regard to the intervention group, the median score was also 25.0 and increased to 69.0. Both groups improved in this category and there was no significant difference (p<0.0734) between the pre- and post-test median scores of the 2 groups in respect of aiming and catching.

The *balance* subtest involves static and dynamic balance where the child has to keep the body upright against gravity while standing on 1 leg and performing hopping and jumping movements (Henderson *et al*., 2007). The median value of the pre-test for the control group was 20.5 and for the post-test the median score decreased to 7.0. The intervention group scores for balance resulted in a median score of 37.0, which decreased to 20.5 at the post-test. While there was a decrease in performance for both groups between pre- and post-test scores, there was a significant difference ($p<0.0472$) with reference to balance between the 2 groups.

The 3 categories of the MABC-2 produced the *total test score*. At the pre-test, the median score for the control group was 5.0 and in the post-test it decreased to 2.0. The pre-test

median score for the intervention group was 9.0 and increased to 12.5 in the post-test. These results indicate a significant difference ($p=0.0018$) between the 2 groups in respect of the total test score.

The results indicate that the control group performed poorer in the post-test with regard to manual dexterity, balance and the total test score compared to the intervention group. It is interesting to note that both groups scored poorer in the post-test with reference to the balance subtest. After the intervention period there was a significant difference between the 2 groups with regard to manual dexterity ($p=0.0191$), balance ($p=0.0472$) and the total test score ($p=0.0018$).

The distribution of the children, according to the traffic light system (degree of motor difficulty) before and after the intervention programme is shown in Figures 1 and 2. Note that only the children classified as borderline or severe motor proficiency impairment took part in the intervention.

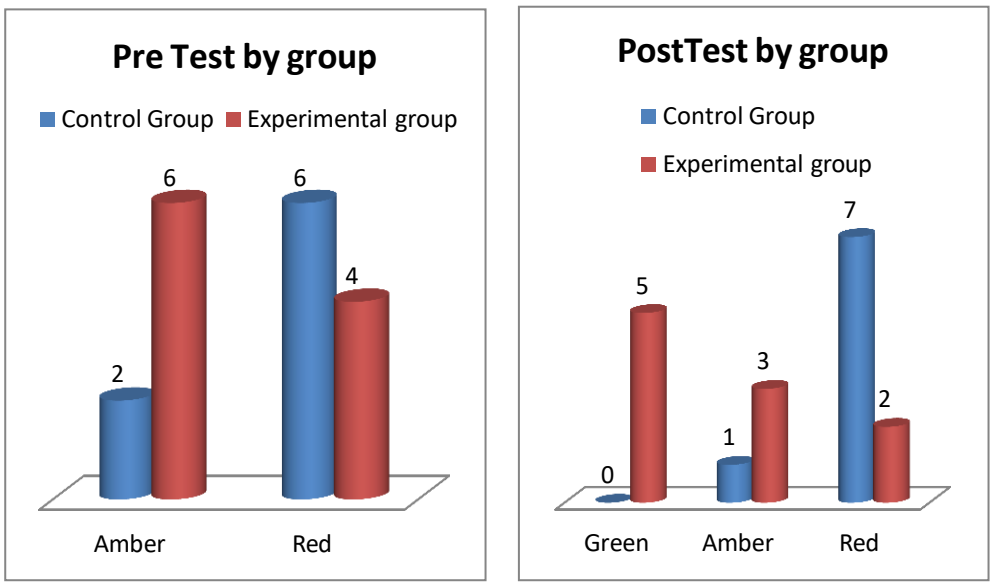

FIGURE 1. **Pre-test placements using the traffic light system by group**

FIGURE 2. **Post-test placement using the traffic light system by group**

As stated previously, the total test score is derived from the 3 subtests and can be interpreted in terms of a 'traffic light' system. The green zone indicates performance in a normal range, the amber zone indicates a child as being at risk and the red zone is an indication of definite motor impairment. After the pre- and post-tests the total test scores of the 18 children were interpreted and placed according to the traffic light system.

Figure 1 indicates the placement with regard to the traffic light system prior to the intervention. The results clearly indicate that all the participants had some form of motor

proficiency problems prior to the intervention. With reference to the control group, 2 children fell in the amber zone and 6 children in the red zone. With regard to the intervention group, 6 children fell in the amber zone while 4 children were in the red zone.

In addition, Figure 2 indicates that subsequent to the intervention, the intervention group performed better in contrast to the control group. The distribution according to the traffic light system was as follows: observing the control group none of the children improved and, therefore, no children were in the green zone (no motor difficulties). In contrast, 5 children from the intervention group improved after the intervention and landed in the no motor difficulty category. Furthermore, the results shows that only 1 child from the control group remained in the amber zone, in contrast to 3 of the intervention group. Finally, 7 children of the control group were in the red zone whereas there were 6 initially. This confirms that children will not outgrow their motor problems. With regard to the intervention group, only 2 children remained in the red zone. The findings of this study indicate that the motor proficiency levels of children with DCD improved to a great extent due to their participation in a sport stacking intervention.

DISCUSSION OF RESULTS

With regard to *manual dexterity*, the results indicate a significant difference ($p=0.0191$) between the 2 groups after the intervention was completed. This is similar to a study conducted by Aparo (2009) who determined the influence of a sport stacking intervention on hand-eye coordination in children. According to the Saskatchewan Physical Education Association (2008), children using both sides of their bodies should improve their bilateral abilities. These statements support the finding of the current study. The children had ample opportunity to use both hands in a coordinated fashion during the speed stacking intervention; therefore, their manual dexterity (ability to use the 2 hands together) did improve significantly compared to the control group.

With reference to *aiming and catching*, it is interesting to note that both groups had a median score of 25.0, indicating a good standard of aiming and catching ability. Both groups improved with regard to aiming and catching. Although the intervention group improved more based on the median score, the results do not indicate a significant difference ($p<0.0734$) between the pre- and post-test median scores of the 2 groups. The improvement of the intervention group correlates with the findings of Udermann *et al*. (2004), who found that sport stacking intervention improves hand-eye coordination and reaction time, which are both important components when executing aiming and catching skills successfully. The findings of Aparo (2009) were of a similar nature. The improvement in both groups can be

attributed to the fact that they had good skills prior to the intervention, thus it is harder to improve on these skills. Another reason for improvement in both groups might be due to the fact that these children participate in a variety of manipulative skills at school.

Even though both groups decreased in performance with reference to the *balance* subtest there was a significant difference ($p<0.0472$) between the 2 groups after the intervention. The decline in performance could be due to the fact that the majority of the children had to be tested on age band 2 during the post-test, indicating that the balancing activities were more

difficult to execute. This may also indicate the need for the intervention to include more balancing activities.

With reference to the *total test score*, a significant difference ($p=0.0018$) was observed between the groups after the intervention. The results, therefore, suggest that children would not outgrow their motor difficulties without appropriate interventions (Henderson & Henderson, 2002; Sugden & Chambers, 2003). It was also apparent that the participants of the current study were a heterogeneous group and it is necessary to address the individual needs of each child. Based on the current study, speed stacking led to a significant improvement with regard to overall motor proficiency. This correlates with Aparo (2009), who also found a significant increase in motor performance after using a speed stacks intervention programme with 20 children between 7 and 11 years of age.

LIMITATIONS

Although the aim of this study was to determine if a sport stacking intervention might improve the motor proficiency levels of children with DCD, the population sample used in this study was obtained from a single institution and province and can, therefore, not be generalised to the larger population of 6 and 7 year old children. It is recommended that the effect of a Sport stacking intervention on children with DCD should be explored further by means of larger samples. In addition, the long-term effects of a sport stacking intervention should be researched. Another limitation to the study was that the children were tested on age band 1 (age 6) during the pre-test. A majority of the children turned 7 during the intervention, and therefore, had to be tested on age band 2, indicating that they had to perform more difficult activities compared to age band 1.

CONCLUSION

The aim of this study was to determine if a sport stacking intervention resulted in an improvement of motor proficiency levels of children with DCD. When children are diagnosed with DCD, it is important to implement motor intervention programmes. Intervention programmes have proven to enhance the motor proficiency of these children (Peens *et al*., 2008). The results suggest that a sport stacking intervention improved the motor proficiency levels of children with DCD. From the point of view of a therapist, no two children are the same, especially children identified with DCD, since they are not a homogeneous group. The findings of this research contribute to the field of study by providing an alternative intervention approach, namely sport stacking, for Kinderkineticists to utilise with the purpose of improving the motor proficiency levels of children with DCD.

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NEURO-MOTOR DEFICITS IN SIX- TO EIGHT-YEAR OLD LEARNERS WITH ADHD AND DAMP

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ABSTRACT

This study investigated the nature of coordination, visual-motor integration and neurological functioning in children diagnosed with ADHD and whether the likelihood of motor impairment will increase with the presence of co-occurring DCD (DAMP). Ninety-five learners (60 boys; 35 girls) with a mean age of 6.9 years participated in the study. Four groups were compared: An ADHD only group (n=42); a group of typically developing children (n=18); a medicated group (n=14); and a DAMP group (n=21). The MABC-2, QNST-2 and the VMI-4 were used to assess the groups. Descriptive statistics (StatSoft, 2012), two-way frequency tables and an ANOVA were used to analyse the results. ADHD learners using medication had significantly poorer fine motor skills ($p<0.05$) than those with only ADHD or typical children. ADHD children using medication and DAMP learners displayed comparable fine motor skills and hand control, although both groups had more impaired fine motor skills than those with only ADHD or typical children. Overall coordination and selected sensory and perceptual impairments increased as a function of co-occurring DCD, indicating that motor coordination does account for overall motor coordination and perceptual and sensory deficits seen in ADHD. These results further confirm a link between ADHD and fine motor problems.

Key words: ADHD; DAMP; DCD; Neuro-motor control; Fine motor skills; Visual-motor integration.

INTRODUCTION

Attention Deficit Hyperactivity Disorder (ADHD) is increasingly described as an everyday phenomenon in society. The American Psychiatric Association (DSM-5, APA, 2013) defines ADHD as a neuro-chemical imbalance in certain areas of the brain, with a strong genetic link. ADHD refers to a disorder that is accompanied by minimal brain dysfunction that includes symptoms like attention deficits, impulsivity and motor over-activity (Cantwell & Barker, 1991; Bester, 2006). According to the APA (2013), 3-7% of all children are affected by ADHD with a boy-girl-ratio of between 2:1 and 9:1 (Sherrill, 2004; Mahone *et al*., 2009; APA, 2013).

Poor motor coordination is reported among children with ADHD (Piek *et al*., 1999; Sergeant *et al*., 2006). Clinical and empirical studies report that 30-50% of children diagnosed with ADHD experience problems with motor coordination. This percentage varies according to the type of motor assessment applied (Gillberg, 1998; Kadesjo & Gillberg, 1998; Geuze *et al*., 2001). Fliers *et al*. (2007) report that motor-coordination problems are present in one-third of

all ADHD-children and that it affects both boys and girls. In an overview article, Harvey and Reid (2003) indicate that children with ADHD have lower physical fitness levels, poorer fine motor skills and also experience problems with gross motor skills.

Most literature, however, indicate a stronger relationship between ADHD and fine motor problems (Szatmari & Taylor, 1984; Harvey & Reid, 2003), although certain studies also report a relationship between ADHD and gross motor problems (Harvey & Reid, 2003; Pitcher *et al*., 2003; Visser, 2003; Tseng *et al*., 2004). Piek *et al*. (1999), claim that the motor impairment of children with ADHD could rather be the result of attention deficiency caused by ADHD, as a secondary result of the disorder rather than a primary symptom. However, Miyahara *et al*. (2006) differ from the above findings and report that fine motor deficiencies are not associated with attention. Kooistra *et al*. (2005) also report no differences between motor impairment of ADHD children and typical children and that motor impairment in ADHD increases as a function of co-occurring disorders, such as reading disability and opposition defiant disorder.

Zang *et al*. (2002) further report an 81.6% overlap of sensory integration dysfunction with ADHD. Ayers (1972) indicates that a lack of inhibition, together with a combination of lack of motor coordination, poor motor planning, varying degrees of perceptual-motor coordination and balance shortcomings are all indicative of sensory integration dysfunction. Furthermore, children with ADHD obtained lower marks in the Sensory Integration Praxis Test (SIPT) for spatial visualisation (mental manipulation of objects in space), static and dynamic balance, copy-design (duplication of a design on a spotted card) and post-rotary nystagmus. These results indicate an inhibition in the vestibular and somato-sensory systems (Ayers, 1972). In addition, the quality of the execution of movement skill patterns among children with ADHD using stimulant medication is described as below average. In this regard, Harvey and Reid (2003) report that locomotor and object control skills of these children were under the 35th percentile when compared with age-related norms.

Researchers report co-morbidity between Developmental Coordination Disorders (DCD), learning-related problems and Attention Deficit Hyperactivity Syndrome (ADHD) (Geuze & Börger, 1993; Schoemaker *et al*., 1994). Scandinavian countries refer to a combination of ADHD and motor-coordination problems (DCD) as "Deficits of Attention and Motor Perception (DAMP)". DAMP is defined as a combination of attention deficit syndrome (ADD), with or without the impediment of hyperactivity or impulsivity, with hampering delays in at least one of the following areas: bilateral motor skills; fine motor skills; perception; and speech and language, in the absence of visible mental retardation and cerebral palsy or another major neurological deviation (Harvey & Reid, 2003).

It appears that overlapping conditions like DAMP (ADHD and DCD) have a greater prevalence of motor problems than when a child displays only ADHD symptoms (Gillberg, 2003; Gibbs *et al*., 2007). In this regard, Harvey and Reid (2003) recommend that future research should describe motor skills of ADHD children from which those who warrant a specific designation of DCD are eliminated from the participant pool, thus not also have DCD to warrant a DAMP classification to determine whether ADHD predicts motor impairment.

RESEARCH PROBLEM

The aim of this study was to examine the nature of coordination-related neuro-motor impairment, as well as visual-motor integration problems among a selected group of 6 to 8

year old children who have been diagnosed with ADHD and DAMP. This research was based on the assumption that children with ADHD in this age range will have neuro-motor impairments and that the nature and extent of the neuro-motor impairments will increase in the presence of co-occurring DCD (DAMP).

METHODOLOGY

Research group

Ethical permission was granted by the NWU ethics committee (nr.06M04) to conduct the study. The headmasters of the 3 different schools selected for the study were asked for permission to conduct the research at the respective schools. A cross-sectional, convenience sample, based on availability was used and Grade 1 and Grade 2 learners from the 3 different schools who were classified with and without ADHD in Brakpan, South Africa, formed the research group. Three quintile 4 schools, which included learners with similar socio-economic backgrounds and diversity, participated in the study. The teachers of the Grade 1 and Grade 2 learners in the selected schools were asked to identify children in their classes, who displayed disruptive behaviour, which could be indicative of ADHD. The teachers and the parents then completed the 18-item ADHD *Disruptive Behaviour Scale* (DBS) (Bester, 2006), for ADHD and both scores were used to identify the subjects for the study.

The research group consisted of 95 learners (60 boys; 35 girls) with a mean age of 6.9 years. The participants were divided into 4 groups for the purpose of comparison. *Group 1* consisted of learners (n=42) that had been diagnosed by means of the DBS with ADHD. *Group 2* consisted of ADHD-learners (n=14) who were diagnosed with ADHD and who were on medication (Ritalin or Concerta), for ADHD. Information about the use of medication for ADHD was obtained by means of a medical history questionnaire that the parents had to complete additionally when they provided consent for the study. *Group 3* included learners (n=18), who did not show symptoms of ADHD. These learners were selected from the classes involved in the study by their teachers who identified them as learners who did not display concentration problems and were probably not ADHD candidates. This was verified by their DBS scores. *Group 4* consisted of learners (n=21), who scored high enough on the *Disruptive Behaviour Scale* and the MABC-2 to be included as a group with both ADHD and DCD (DAMP classification), and who did not use any form of medication for ADHD, as verified from the medical history provided by their parents.

Learners whose parents granted permission for them to participate in the study were thoroughly evaluated with the QNST-2, VMI-4 and MABC-2. Baseline measurements were taken during school hours in the second school term. It is important to note that diagnose, in the context of this study, only meant that the learners were not on medication, were identified according to the DBS as ADHD candidates, and were not necessarily formally diagnosed by a medical practitioner.

Measuring instruments

Movement Assessment Battery for Learners" (MABC)-2

This measuring instrument was developed by Henderson *et al*. (2007) for children in the age range of 4 to 12 years and was used to determine their motor development status. Good validity and reliability was reported for the MABC in the MABC manual (Henderson *et al*., 2007:132-139), and by other researchers (Leemrijse *et al*., 1999). The MABC-2 measures

fine motor skills (FMS) (3 test items), aiming and catching or ball skills (BS) (2 test items), as well as static and dynamic balancing skills (BLS), which can be calculated separately, as well as combining them for a DCD-total score. The test is norm-based and classifies children who fall on or below the 5th percentile with DCD of a serious nature, which requires remedial help. When a child is classified between the 5th and 15th percentile, he/she is considered a DCD risk and someone who possibly requires remediation.

According to the "traffic light system" of the MABC-2, a subject is placed in a red zone (a standard score of 56 or less and a percentile of ≤5%), a yellow zone (standard score of between 57 to 67 and a percentile of between 5% and 15%), or a green/normal zone (for any standard score above 67 and smaller than the 15th percentile). The red zone refers to an existing motor delay (DCD) and the yellow zone refers to a risk for the development of motor delays, while a percentile equal to and greater than 16 indicates normal motor functioning. A higher standard score in the MABC-total and the 3 subscales, thus, indicate better achievement in this test. The various test items of the MABC-2 were assessed by trained researchers with post-graduate qualification in Kinderkinetics.

Quick Neurological Screening Test 2 **(QNST-2)**

The QNST-2 (Mutti *et al*., 1998) is a criteria-based measuring instrument consisting of 15 sub-components that measure visual discrimination, visual perception, fine motor control, hand-eye coordination, muscle tone, motor planning and sequence, spatial orientation and bilateral coordination. The QNST-2 can also be used to verify attention span, distraction, impulsivity, non-verbal concept forming, concept-forming, including perceptual organisation, spatial visualisation and orientation, as well as visual-motor integration. This measuring instrument is suitable for use on persons from the age of 5 to adulthood (Mutti *et al*., 1998). The total score for the QNST-2 is obtained by adding the scores of the 15 subtests. A high score (a total raw count above 50), indicates that the child will probably experience learning problems in the mainstream classroom, while a moderate score (a total 26 to 50) usually indicates moderate maturation delays or moderate neurological impairment. A normal score (25 and less), indicates that the child does not have problems that indicate specific learning deficits.

Developmental Test of Visual-Motor Integration **(VMI)-4**

The VMI-4 (Beery & Buktenica, 1997) is a developmental sequence of geometric forms that have to be copied with pencil on paper. The purpose of the VMI-4 is to do an early screening to identify children who may require special help for the purpose of obtaining the necessary services, testing the efficiency of educational and other interventions and promoting research. The complete 27-item VMI-4 can be applied individually or in a group within 10 to 15 minutes and is suitable for use from pre-schoolers up to adulthood. An 18-item version is available for 3 to 7 years of age. The VMI-4 allocation of points is based on a "point" or "no point" criteria. The VMI-4 version also consists of 2 sub-tests, namely motor coordination and visual perception. The criteria for the VMI-4 allocation of points are as follows: points are allocated according to the number of test divisions the child had completed correctly. The assignment is stopped when a child has executed 3 consecutive test items incorrectly and/or upon completion of a section. After the allocation of points, the standard points are used to place the child in 1 of the 5 groups, from well below average to well above average: 40 to 47 are well below average; 68 to 82 are below average; 83 to 117 is average; 118 to 132 are above average; and 133 to 160 are well above average.

Disruptive Behaviour Scale **(DBS)**

The *Disruptive Behaviour Scale* compiled by Bester (2006) is used to indicate whether a child has attention deficit or not. The 18-item questionnaire is similar to the "Modified Conner‟s Abbreviated Teacher Scale" (Lowenberg & Lucas, 1999), and the abridged version of the Australian Disruptive Behaviour Scale (Piek *et al*., 1999), that is used to identify ADHD. Teachers and parents completed separate questionnaires for each child where they had to indicate which statement currently or during the previous 6 months was most applicable to the child by ticking "never" or "very often" in the different columns.

Items 1 to 9 (A), of the questionnaire focused on ADD (attention deficiency) symptoms and items 10 to 18 (B), on hyperactivity-impulsivity symptoms, whilst 1 to 18 focused on the ADHD (combination type). Allocation of points for the response was as follows: 0= never; 1= now and then; 2= sometimes; 3= regularly; 4= very often. The higher the total, the more characteristics of ADHD are present. There is also an additional column in which teachers and parents have to indicate whether the behaviour experienced is considered as problematic by ticking "Yes" or "No". When the total of A or B is above 24 and it occurs in 2 functional environments, for example, school and home, the child displays a high enough number of symptoms to be diagnosed with ADHD, for example 48 and more. However, more than 6 "Yes" answers have to be ticked in group A or B. The scoring of the responses and interpretation of the results of the "Disruptive Behaviour Scale" was completed by the researcher.

Statistical analysis

The Statistica Release 10 (StatSoft, 2012) computer programme package was used to process the data. Firstly, data was analysed for descriptive purposes by means of mean (M) and standard deviations (SD) (StatSoft, 2012). An analysis of variance (ANOVA) was computed with a Tukey post-hoc analysis to further analyse differences between the groups. A p-value of ≤ 0.05 was accepted as statistically significant.

RESULTS

Table 1 provides the descriptive characteristics relating to gender, age and the number of participants in each of the 4 groups. The groups with ADHD (groups 1 to 3) included more boys than girls with a 1:3 ratio of girls to boys in both the ADHD (Group 1) and the medicated group (Group 2), whilst the DAMP-group (Group 3), had a ratio of 1:2. The group without ADHD was comprised of more girls than boys.

TABLE 1. **GROUP CHARACTERISTICS FOR GENDER AND AGE**

	Total group	**ADHD (G1)**		**Medicated (G2)**		**DAMP (G3)**		**Without ADHD (G4)**	
Variables	N	n	%	n	%	n	%	n	%
Girls	35	13	37.1	3	8.6	9	25.7	10	28.6
Boys	60	29	48.3	11	18.3	12	20.0	8	13.3
Total group	95	42	44.2	14	14.7	21	22.1	18	18.9
Mean age yrs	6.99	7.00		7.00		6.86		7.10	

SD age	0.64	0.66	0.55	0.73	0.58

SD= Standard Deviation G= Group

In the first comparison where learners with ADHD were compared to those without ADHD, the ADHD group was not divided into separate ADHD (n=42) and DAMP (n=30) groups, but was analysed as one ADHD group (n=62). Table 2 displays the results of the group with ADHD (n=62), the medicated ADHD group (n=14) and the group without ADHD (n=18), regarding standard scores and totals obtained in the MABC-2, QNST-2 and VMI-4.

Significant differences ($p<0.05$) were found between the standard scores of the groups for fine motor skills, where the medicated group obtained a significantly poorer mean score compared to the other 2 groups. No significant differences were found in ball or balancing skills or in the MABC total of the different groups. The mean values for visual-motor integration (VMI), visual perception (VP) and motor control (MC) subtests and the QNST-2 total also reflected no significant differences between the groups. The *Palm Form-Recognition* subtest of the QNST-2, however, reflected that the medicated group (4.57±2.31) obtained a significantly poorer mean score than the ADHD group (3.55±2.24) and the group with ADHD (2.94±2.20). Stimulation of the *Hand and cheek* also reflected significant differences ($p=0.047$) between learners with ADHD (1.33±1.67) and those without ADHD (0.50±1.15), where learners without ADHD did significantly better. No significant differences were found in the other subscales of the QNST-2. In general, a trend was observed that the learners without ADHD displayed better mean scores than the medicated group and the group with ADHD in the test variables.

Table 3 displays the results of a similar comparison as reported in Table 2, but with the ADHD group divided into an ADHD and DAMP group. The *MABC-2-percentile* ranking of the DAMP-group (1.30±0.73) was significantly lower than that of the other groups ($p<0.05$). The medicated group obtained the lowest value for fine motor skills, while both the medicated and DAMP group displayed significantly poorer fine motor skills compared to the ADHD and without ADHD groups. The DAMP group obtained the lowest mean MABC total (52.35±16.18), followed by the medicated group (54.15±16.12), compared to the means values obtained in the without ADHD (59.10±18.8) and ADHD group (60.18±10.89), although these differences between the groups were not significant. From a clinical perspective, both the DAMP and medicated groups were categorised below the 5th percentile and in the red zone, which indicates evidence of severe DCD in these groups.

TABLE 2. **GROUP DIFFERENCES: WITHIN MABC-2, VMI-4 & QNST-2**

Variables	**ADHD (alone) (G1)** (n=42) M±SD	**Medicated (G2)** (n=14) M±SD	**Without ADHD (G3)** (n=18) M±SD
Fine motor skills	6.22±2.99[2]	4.69±1.97[1,3]	7.50±3.25[2]
Aiming & catching skill	7.98±3.08	9.00±2.79	7.63±2.94
Balance skills	6.76±2.24	5.92±2.93	7.69±2.62
MABC-Total	58.08±13.31	54.15±16.12	59.10±18.8
MABC-SS	5.94±2.38	5.38±2.90	6.63±1.96
DCD-Percentile rank	2.19±0.85	2.38±0.87	2.63±0.62
Visual-motor integr. SS	89.85±15.35	90.38±13.74	87.38±25.78

Visual perception SS	87.42±20.10	80.31±27.23	96.01±19.4
Motor coordination SS	83.29±16.12	84.23±18.81	92.20±12.19
QNST-2-Total	45.14±11.50	38.46±12.14	41.10±11.39
QNST-2-Category	2.34±0.81	2.15±0.80	2.56±0.73
Hand skill	1.11±0.62	1.00±0.55	0.83±0.70
Figure recognition	2.46±1.14	2.28±0.82	2.16±0.85
Palm form-recognition	3.55±2.24[2,3]	4.57±2.31[1,3]	2.94±2.20[2]
Eye function	4.44±3.22	3.85±3.67	5.11±3.61
Sound patterns	7.57±3.68	6.50±3.79	8.22±5.00
Finger to nose	3.53±1.77	3.07±1.38	3.44±1.09
Thumb-finger-circles	3.42±1.73	2.71±1.20	3.38±2.09
Stimulation, hand & cheek	1.33±1.67[3]	0.57±0.51	0.50±1.15[1]
Repetitive hand movements	3.00±2.63	2.21±1.47	2.16±2.95
Arm-and-leg extension	5.14±2.43	3.64±2.92	3.83±3.05
Tandem walk	3.22±1.94	3.28±2.33	2.88±1.99
One-legged standing	2.01±1.25	2.33±2.00	2.11±1.23
Skipping	0.31±0.96	0.35±0.84	0.33±0.84
Left-right discrimination	2.46±0.85	2.07±1.14	2.27±0.75
Behaviour	1.53±1.01	1.92±1.07	1.22±1.06

M= Mean SD= Standard Deviation p-value ≤ 0.05 SS= Standard score,
G= Group [1,2,3] = Significant differences between groups

A big variation was, however, evident from the standard deviations in all the groups which should be noted. No group differences were found between the mean scores obtained for the VMI and the visual perception subtest of the VMI, although the *motor coordination* subtest scores indicated significant group differences, where the DAMP group performed significantly poorer than the ADHD group (p=0.001) and the group without ADHD (p=0.005).

TABLE 3. **GROUP DIFFERENCES: MABC-2, QNST-2 AND VMI-4 IN DIFFERENT CATEGORIES OF ADHD AND DAMP**

Variable	**DAMP (G1)** n=30 M±SD	**ADHD (alone) (G2)** n=42 M±SD	**Without ADHD (G3)** n=18 M±SD	**Medicated (G4)** n=14 M±SD
Fine motor skills	4.95±2.68[2,3]	6.81±2.97[1]	7.50±3.25[1,4]	4.69±1.97[1,3]
Aiming & catching sk.	7.50±3.58	8.21±2.82	7.63±2.94	9.00±2.79
Balance skills	6.40±2.74	6.93±1.98	7.69±2.62	5.92±2.93
MABC-Total	52.35±16.18	60.81±10.89	59.10±18.8	54.15±16.12
MABC-SS	5.00±2.85	6.38±2.01	6.63±1.96	5.38±2.90
MABC-percentile	1.30±0.73[2,3,4]	2.61±0.49[1]	2.63±0.62[1]	2.38±0.87[1]
VMI SS	87.95±16.20	90.76±15.04	87.38±25.78	90.38±13.74
Visual Perception SS	82.15±23.95	89.93±17.77	96.01±19.40	80.31±27.23

Motor Coordin. SS	71.15±17.99[2,3]	89.07±11.39[1]	92.20±12.09[1]	84.23±18.81
QNST-2-Total	48.70±11.93	43.42±11.03	41.13±11.39	38.46±12.14
QNST-2-category	2.05±0.89	2.48±0.74	2.56±0.73	2.15±0.80
Hand skill	1.15±0.63	0.96±2.22	0.83±0.70	1.00±0.55
Figure recognition	2.61±1.22	2.22±0.91	2.16±0.85	2.28±0.82[1]
Palm form recognition	3.81±1.97[4]	3.43±2.45	2.94±2.20[1]	4.57±2.31[1,3]
Eye function	4.73±3.26	4.31±3.41	5.11±3.61	3.85±3.67
Sound patterns	7.57±3.56[4]	7.51±4.24	8.22±5.00	6.50±3.79[1]
Finger-to-nose	3.57±1.62	3.36±1.61	3.44±1.09	3.07±1.38
Thumb-finger-circles	3.39±1.85	3.26±1.68	3.38±2.09	2.71±1.20
Hand/cheek stimulation	1.34±1.54	0.87±1.46[3,4]	0.50±1.15[2,4]	0.57±0.51
Repetitive hand movem.	2.94±2.45	2.57±2.65	2.16±2.95	2.21±1.47
Arm-and-leg extension	5.28±2.64[4]	4.26±2.65	3.83±3.05	3.64±2.92[1]
Tandem walk	3.23±2.01	3.12±2.01	2.88±1.99	3.28±2.33
One-legged standing	2.15±1.12	1.94±1.31	2.11±1.23	2.33±2.00
Skipping	0.31±0.93	0.33±0.91	0.33±0.84	0.35±0.84
L/R-discrimination	2.42±0.82	2.33±0.93	2.27±0.75	2.07±1.14
Behaviour	1.65±1.02	1.45±1.05	1.22±1.06	1.92±1.07

SD= Standard Deviation M= Mean p-value $\leq$ 0.05 SS= Standard score,
G= group [1,2,3,4] = Significant differences between groups VMI = visual-motor integration

From a clinical perspective, the scores obtained by the DAMP and medicated group for visual perception indicated below average performance, while the DAMP group additionally showed below average performance in their motor coordination or hand control skills which was significantly poorer compared to the other groups.

The DAMP group (48.70±11.93) also obtained higher and thus poorer values in the QNST-2 total, compared to the other groups, although the differences between the groups were not statistically significant. The highest variation in mean scores was, however, evident from the standard deviations in the DAMP and medicated groups which could have influenced the results. The DAMP group obtained significantly poorer scores than the medicated group in the *Palm Form Recognition*, *Arm-and-leg extension* and in the *Sound patterns* subscales. The stimulation of the *Hand-and-cheek* subscale also yielded significant differences between groups, where the ADHD and typical children obtained significantly better mean scores than the medicated group (M=0.57). In general, a trend was observed that the children with ADHD alone and typical children displayed better scores compared to the medicated and DAMP groups in the QNST test variables·

DISCUSSION

The purpose of this study was to examine the nature of coordination-related neuro-motor deficiencies and visual motor integration problems in a selected group of 6 to 8 year old

children with ADHD, and to establish whether impairment increased with co-occurring coordination problems (DAMP). The results confirmed that children with DAMP had poorer fine motor coordination than those in their peer group who were classified with ADHD (alone), or as typical children. All three measuring instruments that were used in the study included assessments of fine motor skills and all these confirmed inferior fine motor skills in children with DAMP. Significant differences were found in the MABC (fine motor skills) and VMI (hand control as assessed by the motor coordination subtest), with a trend in the QNST where the DAMP group obtained the poorest score of the different groups for hand skills (Table 3). Typical children displayed the best fine motor skills of the different groups, which was, however, not significantly superior to that of ADHD (alone) children (Table 2). When the ADHD groups were separated (Table 3), the differences became significant between the DAMP and the ADHD (alone) groups, confirming that co-occurring coordination problems contribute to impairment of fine motor skills (FMS).

Furthermore, learners with DAMP had significantly poorer FMS than the group with ADHD alone. The group on medication also differed significantly from the ADHD (alone) group and the control group of typical children regarding their fine motor skills, although they displayed similar poor fine motor skills as the DAMP group. This leads to the conclusion that the medicated group probably included children suffering from ADHD of a more serious nature who are for this reason, already using medication for the syndrome. The medicated group could also not be separated further if DCD were identified within this group, which could also have contributed to the poorer values found in this group compared to the ADHD (alone) group.

These results agree with the findings of Piek *et al*. (1999), Harvey and Reid (2003) and Pitcher *et al*. (2003), who indicated that children with ADHD experience FMS problems. This confirms that when children with ADHD also experience problems with coordination, to such an extent that they can be classified with DAMP, their fine motor skills will be more impaired. Kooistra *et al*. (2005) reported supporting evidence that motor impairment in ADHD increased as a function of co-occurring disorders, and that the presence of reading disorders, rather than ADHD, predicted motor impairment.

The results of the study of Pitcher *et al*. (2003) on 7 to 12 year old boys using the MABC-2 and the "Conner"s Parent Rating Scale-Revised", indicated in that ADHD learners experienced motor coordination problems similar to those of learners with DCD (developmental coordination disorder), especially among ADHD learners with predominant attention problems, and the combined sub-type who experienced problems with FMS. According to these researchers these problems cannot be ascribed to attention deficit, but rather to problems with motor skills (DCD co-occurring with ADHD). Contradictory to this, Polderman *et al*. (2011) report a weak association between ADHD and motor control accuracy, and no association with motor control stability as tested by means of pursuit tracking.

The results of the current study confirmed inferior fine motor skills among ADHD children, irrespective of whether they had DCD or not, but it was also clear that fine motor impairment increased as a function of co-occurring DCD (DAMP classification). The MABC percentile ranking of the DAMP group also indicated general overall poor coordination in this group. Along with the medicated ADHD group, both groups obtained a mean MABC total that placed them in the severe DCD zone which, from a clinical perspective, indicated that these

children need remediation for their coordination problems. DAMP children also displayed additional perceptual and sensory problems as indicated by three subtests in the QNST (*Palm-form recognition, Arm-and-leg extension, Sound patterns*), which were not found in the medicated ADHD group ADHD (alone), or typical children. DAMP and the medicated ADHD learners furthermore displayed visual perception standard scores according to the VMI manual that categorised both groups in an under average category.

These results agree with literature that report that co-occurring conditions, such as DAMP (ADHD and DCD), contribute to increased motor impairment compared to when ADHD occur alone (Gillberg, 2003; Gibbs *et al*., 2007). These results also agree with the findings reporting negative impacts of DAMP on daily activities that require fine motor coordination, e.g. dressing, eating and academic achievement due to poor writing skills (Gibbs *et al*., 2007). Gillberg *et al*. (1983) also reported that learners with DAMP between the ages of 6 and 8 years, who had been evaluated in a neurological screening test, displayed significant lower values than a control group over a period of 10 years. Recent studies claim that DAMP is not attention related, but should rather be regarded as a motor delay problem (Miyahara *et al.*, 2006).

The QNST-2 total of the DAMP group was the poorest of all the groups compared, although no group differed significantly from one another. Although a trend was established that the DAMP group obtained the lowest scores in all the subtests of the QNST-2, no significant differences were found indicating that their performance was worse than the ADHD group

and the without DCD group. Significant differences were, however, established between the DAMP and medicated groups in three subtests of the QNST-2, indicating worse perceptual and sensory functioning skills in the DAMP group compared to ADHD children using medication for the condition.

Kutcher (2002) describes the child with ADHD as one who neither starts to focus on a new task beforehand, nor is capable of focusing or paying attention to what is important at the moment. Relevant sensory stimuli are thus lost during the information processing phase, which is indicative of sensory integration dysfunction. The child with ADHD could as a result be sensory dull (Oaklander, 1994). By applying selective attention to a task, a child is able to ignore unimportant information and only focus on what is important. These may provide possible reasons why learners with ADHD had poorer sensory sensitivity than the group without ADHD during perception and sensory integration skills, since this group did not receive any medication.

Therefore, the findings of this study agree with literature findings that indicate that when learners with ADHD also experience motor coordination problems, fine motor skill deficits are more prevalent.

LIMITATIONS AND RECOMMENDATIONS

This study had limitations that need to be acknowledged. A relatively small group formed part of the study, which became even smaller when the group was divided into more specific groups. Only the children in the medicated group were diagnosed formally by a medical practitioner, while the „diagnoses‟ made for the other children were based on the DBS scores that were obtained from parent and teacher assessments. The medicated group could

furthermore, not be subdivided if DCD was diagnosed, because of the small number of participants in the group, and their results could subsequently be masked by this. The overall group was also analysed as an ADHD group, without taking into consideration the different subtypes of ADHD, such as predominant attention and hyperactive impulsivity types because of the small number of participants, which could also have influenced the results. Further research is, therefore, recommended where similar comparisons can be drawn by also taking the different sub-types of ADHD into account. Further studies are, furthermore, also recommended to confirm the results of this study.

CONCLUSIONS

The findings of this study confirmed that fine motor skills of children with ADHD, who are using medication, such as Ritalin and Concerta, and ADHD children with co-occurring DCD (DAMP), are impaired compared to children with ADHD, who are not using medication and typical children. Furthermore, impaired overall coordination and perceptual and sensory motor functioning in ADHD increased as a function of co-occurring coordination disorder, and the presence of DAMP, rather than ADHD, predicted perceptual and sensory motor impairments.

Neurological functioning as assessed by different testing protocols and visual motor integration skills did not appear to differ among children with or without ADHD symptoms.

Notwithstanding, tendencies of lower values and significant differences in *Palm form recognition, Arm-and-leg extension* and *Stimulation of the hand and cheek* and *Sound patterns* subscales were found in the DAMP group compared to the medicated group suggesting sensory shortcomings in tactile and perceptual skills, as well as in muscle tone. The performance of the medicated group in these neurological screening subtests was similar to the ADHD (alone) and typical children as no significant differences were found between these groups. This suggests a positive outcome of medication on perceptual and sensory functioning, and subsequently neurological functioning in general on the attention of these children.

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ANALYSIS OF EXISTING LITERATURE ON MANAGEMENT AND MARKETING OF THE FITNESS CENTRE INDUSTRY

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ABSTRACT

The present paper discusses a literature analysis to provide a comprehensive overview of the current status of research on the management and marketing of fitness centres. Four data bases were utilised: SCOPUS, ABI INFORM, ISOC and SPORTDISCUS. The following combination of search terms was employed: 'fitness industry' and 'fitness centre'. These key words exposed about 87 articles that were published between 1980 and 2013. The articles were categorised chronologically and by publishing journal and content. The results revealed that the body of knowledge of fitness centres is heterogeneous. The thematic areas of the content of the articles are, in the order from the most number to the least number of publications: quality; satisfaction and loyalty; human resources; sociological aspects; organisational culture; segmentation; sport facilities; and innovation.

Key words: Fitness industry; Literature analysis; Systematic revision; Thematic structuring.

INTRODUCTION

The fitness sector is a market which, according to Afthinos *et al*. (2005), is in constant growth while they produce and coordinate services and products related to well-being and aesthetics. Yildiz (2011) explains these services as the overall intangible activities based on physical

activities that create value for individuals by offering them physical, psychological, social and economic benefits. Specifically, IHRSA (2014) affirms that this sector gained over 78 million dollars at a global level of which Europe and North America were the greatest revenue generators. Currently, there are more than 165 000 fitness centres. Latin America has the largest number of sport facilities and North America has the largest number of members. Emerging clients include: Asia, Latin America and Africa, which are in the growth phase. According to data from the Special Euro-barometer 412 (2014), 11% of Europeans are members of a fitness centre with 1% being from Lithuania and 33% from Sweden. Similarly IHRSA (2014) affirms that more than 44 million of Europeans are members of the 49 000 fitness centres in Europe. This is important since the fitness sector has an 8.13% penetration in the European market (IHRSA, 2006), contributing to an economic growth of 4% to 6% annually. Of the major problems of this sector is the abandonment by the client (Ferrand *et al*., 2010), which makes a healthy management of resources necessary to implement good marketing practices.

Additionally, customer loyalty has been associated with perceived quality and satisfaction in these organisations (Parasuraman *et al*., 1985). In fact, studies in the fitness industry have shown that organisational culture can influence employee loyalty (MacIntosh & Doherty, 2010), and employee loyalty affects customer loyalty. Hence, a correct management of human resources becomes indispensable for the success of these organisations being that there exists a direct employee-client relationship (Chelladurai, 2005). In actuality, innovation is necessary for growth and success of sport organisations (Yoshida *et al*., 2013), where client behaviour will be determined by the innovations of the organisations and the distribution of the facilities. To address the clients' needs, the marketing plan establishes segmentation as one of the necessary actions to meet each client's need (Teva-Villén *et al*., 2014), understanding that sociological aspects play a part due to the diversity of participants.

RESEARCH PROBLEM

In a sporting market, involving the practice of physical activity, it is necessary to examine the management practices of managers to identify the weak aspects and utilise its strengths. At the same time, inquiry about the marketing strategies implemented, which identify the direction of commercialisation of physical activity in this type of organisation. For this reason, cognisance of the body of knowledge is a necessary aspect to know what occurs within the sport organisations and propose future lines of research that support an emerging sector as is the industry of fitness. As there is an unknown variable on what the management and marketing practices being used in the fitness industry is, the objective of this paper was to reveal the articles published between 1980 and 2013 in relation to the management and marketing of fitness centres and propose future topics for investigation.

METHODOLOGY

Data sources and searches

An extensive literature search of electronic databases, including SCOPUS, ABI Inform, ISOC and SPORTDISCUS, was performed to identify relevant articles. The keywords used were: fitness industry; and fitness centre. The search terms which were used were a combination of the previous by using the Boolean logic. Simply, where similar concepts were assembled with 'OR' while intersecting concepts were joined with 'AND'.

The reference list of each selected article was examined to identify other potentially relevant papers following the technique known as 'snowball'. The last search was performed on 29 March, 2013. Data collection was conducted by 3 independent investigators from the University of Seville (Spain) and 1 researcher from West Virginia University (USA) with experience in management and marketing research of fitness centres. All researchers conducted their searches independently and then came together to discuss their findings and to achieve consensus regarding the information gathered.

Study selection

The titles and abstracts obtained were screened to remove the irrelevant or duplicated articles. The full texts of the remaining articles were then read in detail to identify their eligibility. The inclusion criteria were: (1) articles related to the content criteria for management and marketing that were published in academic journals; (2) the topics of fitness industry and/or fitness centre, should appear in the title, abstract or keywords; (3) articles between 1980 and 2013 located in the areas of psychology, social sciences, management, marketing and accounting; and (4) articles published in English.

Methodological quality assessment

Once the relevant articles for review were finalised, the Jadad Scale was used to systematically determine the quality of the studies for approval and acceptance. A high standard of the results of the articles was sought for selection for the analysis. The standard set for selection was all the articles that earned a punctuation of 3 or more points, which is an indication of good quality. The Jadad Scale was chosen because it is an easy design and has the capacity to provide a global overview of the external and internal validity of the articles included in this systematic review.

Data analysis

Once the articles were selected through the systematic review, the authors proceeded on to data extraction. The data was analysed from the selected articles by 2 of the authors of the current review and subsequently checked by a third. Potential disagreements were discussed and the third author resolved any remaining disagreements. All the articles were categorised according to its nature by the personal criteria of the reviewers who proceeded to sort them in the agreed 8 themes: (1) Quality, satisfaction and loyalty; (2) Organisational culture; (3) Innovation; (4) Sports facilities; (5) Human resources; (6) Segmentation; (7) Sociological aspects; and (8) Other.

RESULTS AND DISCUSSION

The initial search exposed 763 articles. However, most were eliminated based on repetitive appearances on multiple databases on all 4 databases or keyword topic of articles that had nothing to do with the relevant subject matter for this study. Ultimately, 113 articles met the criteria (Table 1).

TABLE 1. **NUMBER OF ARTICLES ACCORDING TO DESCRIPTORS**

Database	Key words	Total	Selected

SCOPUS	Fitness Industry	49	18
	Fitness Centre	577	31
ABI INFORM	Fitness Industry	17	17
	Fitness Centre	3	3
SPORTDISCUS	Fitness Industry	87	33
	Fitness Centre	28	9
ISOC	Fitness Industry	1	1
	Fitness Centre	1	1
Total		**763**	**113**

The initial search resulted in 113 articles of which 87 were used when the previously explained criteria based on intended content was applied. When considering the year of publication, an increase in articles addressing the topic of interest can be observed. For example, from 1980 and 1990, 7 articles were published. The first decade of the 21st century produced 52 publications and this continued to rise in the second decade which had already produced 27 publications on this topic as of March 2013 (Figure 1).

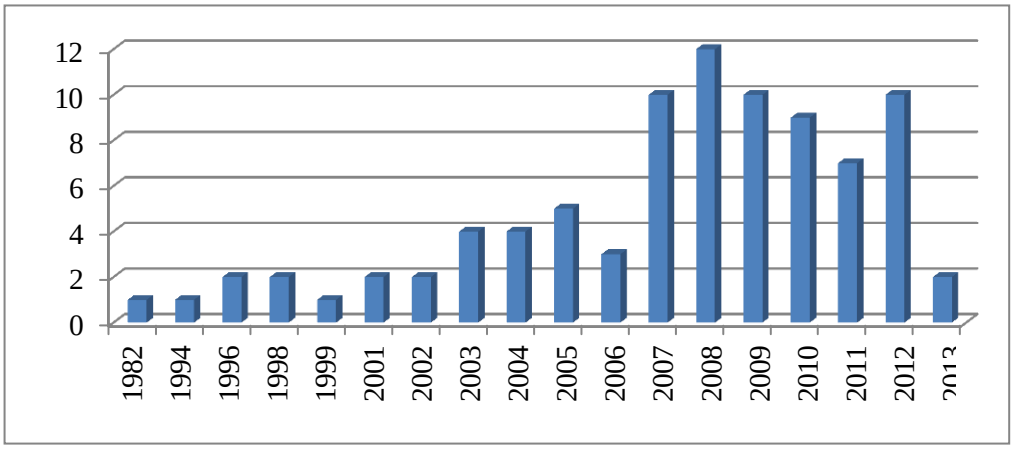

FIGURE 1. **NUMBER OF PUBLICATIONS BY YEAR**

Regarding where the studies were published, there is a rich diversity of journals having accounted for up to 64 indexed journals that published on these topics. Journals responsible for having a greater number of publications on the subject are as follows: *International Journal of Sport Management and Marketing* with 7 articles published; *Perceptual and Motor Skills* (journal) with 5 articles published; and *Managing Leisure*, *Managing Service Quality* and *Sport Management Review* with 4 articles each; or what is equivalent to 6.25% of the journals that published articles on the subject (Table 2).

TABLE 2. **TITLE OF JOURNAL AND NUMBER OF RELATED PUBLICATIONS**

Title of Journal	**No. publ. per Journal**

International Journal of Sport Management & Marketing	7
Perceptual and Motor Skills	5
Managing Leisure; Managing Service Quality; Sport Management Review	4
Journal of Sport Management; Psychology of Sport & Exercise	3
Revista de Psicologia del Deporte; South African Journal for Research in Sport, Physical Education & Recreation; Women in Sport & Physical Activity Journal	2

TABLE 2. **TITLE OF JOURNAL AND NUMBER OF RELATED PUBLICATIONS *(cont.)***

Title of Journal	**No. publ. per Journal**

ACHPER Healthy Lifestyles Journal;	Journal of Education and Work	
Adapted Physical Activity Quarterly	Journal of Health Care Marketing	
African Journal for Physical, Health Education, Recreation & Dance	Journal of Legal Aspects of Sport	
Apunts. Educación Física y Deporte	Journal of Management Education	
Behavior Modification	Journal of Muslim Minority Affairs	
British Journal of Sociology	Journal of Retail & Leisure Property	
Cuadernos de Psicología del Deporte	Journal of Science & Medicine in Sport	
Cultural Studies	Journal of Services Marketing	
Education, Physical Training, Sport	Journal of Sports Medicine & Physical Fitness	
European Business Review	Journal of Targeting, Measurement and Analysis for Marketing	
European Journal of Cultural Studies	Journal of Wuhan Institute of Physical Education	
European Journal of Sport Science	Leisure Studies	
European Sport Management Quarterly	Missouri Journal of Health, Physical Education, Recreation & Dance	
Gestao e Producao	Movimento	
Health Marketing Quarterly	Personnel Psychology	
Human Resource Management Journal	Professionalization of Exercise Physiology	1
ICHPER-SD Journal	Psychological Reports	
Industrial Relations Journal	Quality and Quantity	
International Journal of Business and Social Science	Relations Industrielles	
International Journal of Exercise Science	Research Quarterly for Exercise & Sport	
International Journal of Medicine and Science of Physical Activity and Sport	RETOS. Nuevas Tendencias en Educación Física, Deporte y Recreación	
International Journal of Sport and Exercise Psychology	Small Group Research	
International Journal of Sports Law & Management	Social Behaviour and Personality	
International Journal of Sport Management	Social Marketing Quarterly	
International Journal of the History of Sport	Sociology of Sport Journal	
Investigación y Marketing	Spanish Journal of Psychology	
Irish Marketing Review	Total Quality Management	
Journal of Aging & Physical Activity	Total Quality Management & Business Excellence	
Journal of Beijing Sport University	Urban Anthropology	
Journal of Consumer Health on the Internet	Work, Employment and Society	

The total number of articles published in journals indexed in the Journal Citation Reports (JCR) was 44 of the 87 selected. Of these, 75% were published from the year 2005 and beyond (Figure 2).

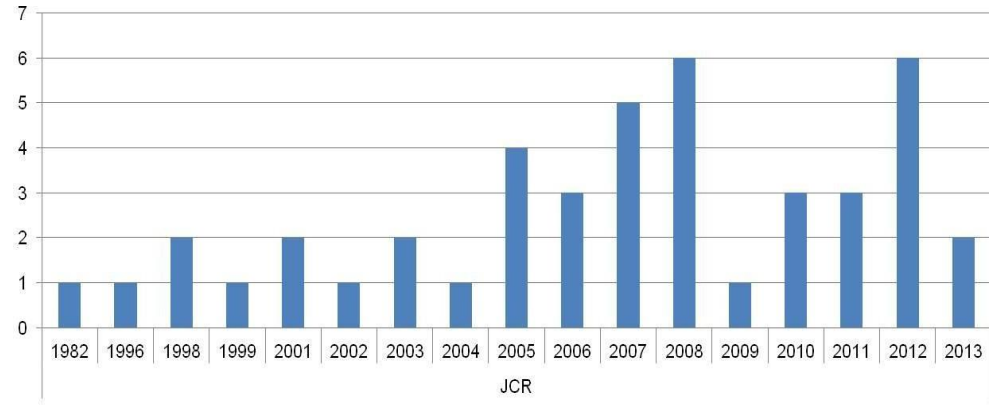

FIGURE 2. **NUMBER OF ARTICLES PUBLISHED IN JCR JOURNAL BY YEAR**

All articles used in the present study were analysed and categorised (Table 3) according to 8 thematic areas previously provided.

TABLE 3. **THEMATIC CONTENT AREAS OF STUDY**

Thematic areas	Selected articles
Quality, satisfaction and loyalty	29
Organisational culture	5
Innovation	2
Sports facilities	3
Human resources	21
Segmentation	3
Sociological aspects	17
Other	7

Quality, satisfaction and loyalty

The literature suggests a connection between quality, satisfaction and loyalty. These 3 are often measured in the same study. Therefore, they have been placed in the same category. There seemed to be a growing interest to measure quality, satisfaction and loyalty of fitness centre clients. An example is the CALIDFIT scale (García *et al*., 2012), which measures a direct relationship between consumer quality perception and the level of satisfaction of fitness centre consumers. The less specific 6-Sigma scale (Cheng *et al*., 2012), offers interesting possibilities to measure the specifics of the customer and improved service. Satisfaction surveys (De Barros & Gonçalves, 2009), measure client expectations which, as expressed by

the authors, are easy to resolve. Service quality was measured in various studies through different instruments. Chia-Ming *et al*. (2005) established the constructs that give rise to the satisfaction of the clients in the Taiwanese fitness industry by using the Scale of Service Quality for Participant Sport (SSQPS). The QUESC questionnaire utilised by Afthinos *et al*.

(2005) and Bodet (2009), suggest that the nature and intensity of the product of consumption exerts a strong influence on exercise service elements in the case of consumers, bringing about an impact on customer satisfaction and the value of the product consumed. Qualitative studies defined psychological benefits of the sporting practices to create customer loyalty and employee satisfaction (Athanasopoulou, 2008). Satisfaction relates to the concept of pleasure, mental change and changes in the physical world (Lagrosen & Lagrosen, 2007).

Satisfaction surveys have revealed gaps in the study of the fitness industry in the areas of quality management strategies (Hurley, 2004; Soita, 2012). Researchers have placed emphasis on understanding how marketing strategies in a fitness centre can influence the improvement of service resulting in customer satisfaction (Tawse & Keogh, 1998; Basheer, 2010), attracting new customers and keeping those they already have by proposing strategies of customer loyalty (Annesi, 1998; Annesi & Annesi, 1999; Pinillos, 2004; Annesi, 2007; Annesi & Unruh, 2007). Placebo studies testing for the interest of clients in a control group were also found (Estabrooks *et al*., 1996). The relationship between the level of grip and the satisfaction of clients according to the treatment that the staff of the centre offers has been investigated (Dhurup *et al*., 2006; Athanasopoulou, 2008; Athanasopoulou & Mylonakis, 2009; Dhurup & Surujlal, 2010), and propose different ways to increase the quality of inter-personal relationships among workers and customers.

Other researchers focus on creating conceptual models that examine and provide value in the sporting establishments (Ferrand *et al*., 2010). Along the same line, Moxham and Wiseman (2009) presented the case of a fitness centre leader in the United Kingdom and examined how the development, implementation and measurement of quality can be used to obtain a competitive advantage. They concluded that in order to provide quality service in fitness centres, the measurement should be conducted without the pressure of achieving specific objectives or determined standards. Alexandris *et al*. (2008) examined service quality when surveying those with the highest responsibility of a fitness centre chain in Greece. They found that several aspects showed direct relationships with the loyalty and the perceived quality of the service, such as facility design, logo or nostalgia.

Some studies analyse customer loyalty and the use of sport facilities. Hill and Christine-Green (2012) analysed different types of sport (individual and team), as well as facilities. The results revealed that the design of the installation had more impact on the frequency of participation in a fitness centre, and a minimal impact on the participation of the customers of the sport facilities. Customer loyalty can be assessed by the personal profile of the customer, such as age (García & Pires, 2010) and lifestyle (Suresh *et al*., 2011). Whereas, MacIntosh and Doherty (2007) identify greater quality of the fitness centres from the better allocation of the organisational culture through the creation of a system of values, beliefs and assumptions inherent in their own brand. These promote loyalty among customers and in turn improve the message for potential customers. On the other hand, some of the larger fitness chains create customer loyalty based on an image associated with a quality product sold only in exclusive establishments. This resulted in being beneficial for both the brand and the establishment.

This symbiotic relationship can be appreciated in the dynamic of THE COACH APPROACH® and the YMCA Fitness Centres in Atlanta (USA) (Annesi, 2007).

Organisational culture

Organisational culture has been defined in different ways and has led to a large variety of

concepts and methods for studying the construct. It is particularly in the body of knowledge of the fitness industry that authors like Enric W. Macintosh and Alison Doherty emerge as the principal investigators. This construct has been understood primarily as an internal phenomenon of the company that has an impact on the staff. However, in recent times, positioning is a factor that is part of the company's image (MacIntosh & Doherty, 2007). Organisational culture is known as the values, beliefs and basic assumptions that are guided by the leadership, shared by the employees and that explain how things are done in the organisation (MacIntosh & Doherty, 2007). MacIntosh and Doherty (2007, 2008) conclude that customer perception of organisational culture is significantly associated with satisfaction and the intention to stay and continue within the fitness centre. Later, MacIntosh and Doherty (2010) studied the impact of organisational culture on the satisfaction and the intention to resign in the case of the personnel and revealed that organisational culture explains 14.3% of the variance of employee satisfaction and 50.3% of the intent to resign from their employment. The transitory nature of jobs in this industry has an impact on the management of this type of sport organisation (MacIntosh & Walker, 2012).

Innovation

In relation to the work framed in innovation, it should be remembered that, although it has been a topic that has not developed, there are some authors that delve into this aspect from different points of view. Yuan *et al*. (2009) propose a model for the analysis of innovative activities for the company, developing the process into 3 stages: innovation-innovation; innovation processes; and results of the innovation. Success can be analysed by means of 4 indicators: mastery of technology; good governance; diversified talent recruitment; and improvement in the positioning of the brand. In another approach, Zolfagharian and Paswan (2008) studied the way in which the customers perceived innovations built into the service elements in a fitness centre by developing a scale of 32 items from 7 categories: administration; indoor facilities; outdoor facilities; employees; core services; technology; and capacity of response.

Sport facilities

Research directed on sport facilities has been approached from different perspectives. Arbour-Nicitopoulos and Ginis (2011) did a study at 44 sport facilities in Ontario (Canada) that were identified as 'accessible' proving that none of them completely related to people with reduced mobility. Recreational facilities were more inclusive than fitness centres, especially in the areas of entry, parking and professional support during workouts. Marmol *et al*. (2010) addressed the quality of the fitness centres in a Spanish city in relation to the prescription of physical exercise, the services offered, the infrastructure and the equipment of the facilities. Their study revealed that the majority of the facilities do not influence the workouts of their members, despite the fact that they offered a multidisciplinary team of physical therapists, nutritionists and personal trainers as profound features of the facilities.

Furthermore, Garcia and Sañudo (2009) specifically evaluated the perception of directors and coordinators of private fitness centres relating to the adequacy of their facilities for users who were over 60 years old.

Human resources

Because the fitness industry is a service industry, it could suggest that human resources play

an influential role. Studies conclude that in the majority of the cases, articles relating to human resources stipulate this as the most common issue of concern to researchers, which may be due to the fitness industry strongly emphasising customer service. Thus, in keeping with the continued evolution of the fitness industry, the organisation should be willing to adapt its most precious resource in this maelstrom of change. Getting to know the organisations becomes very interesting for researchers and managers. In this sense, knowing and determining the performance indicators of an organisation becomes a popular topic of study.

Emotional stability and the extraversion of the workers in fitness centres have an impact on the performance of organisations more than other personality traits (Judge & Erez, 2007). Maconachie and Sappey (2013) analysed the relations between the workers, managers and the whole system of relationships that occurs in a fitness centre. Lubinsky *et al*. (2011) examined the philanthropic spirit in the fitness centre and the emotional commitment to the company, their support at certain events and the employees who participated.

Continuing with the success of organisations, the satisfaction of human resources were considered which is determined by maintaining positive environments favouring the happiness of the workers and that support the guidelines of OSHA (Occupational Safety and Health Act) (Fried, 2009). Also, one of the most prominent figures currently in the fitness industry is the personal trainer. Hence, the degree of satisfaction of personal trainers has become a topic for further study. Coaches that work for a company with lower levels of satisfaction to the self-employed are mainly due to the level of earned wages and to the limited opportunities for promotion (Moodley & Coopoo, 2006). However, the greatest reward for coaches is earned by the social recognition within the fitness centre (Sappey & Maconachie, 2012). Coach evaluations and their rehiring were investigated in various studies (Sartore & Cunningham, 2006, 2007; Chiu *et al*., 2010).

On the other hand, Wininger (2002) studied the relationship between certain features of the fitness instructor and the enjoyment of the users. Their results show that only 3 of the 9 characteristics accounted for 17% of the variability of enjoyment: the ability of the technician; communication skills; and the pleasure of the other participants in the class. Similarly, Harju *et al*. (2003) addressed the preference of the women, who do exercise in a fitness centre, for a type of coach on the basis of their training goals.

There seems to be a lack of regulation of and consensus about the qualification and training of human resources. Some of the work focusing on this topic has been done by Viallon *et al*. (2003), Lloyd (2005a, 2005b), Lloyd (2008), Sekendiz *et al*. (2009) and Lloyd and Payne (2013). Koustelios (2003) sought to develop a valid and reliable instrument to identify the skills needed to manage the fitness centres. The results revealed 4 dimensions that related to

marketing and communication, human resources management, financial management and administration. Also, there were significant differences between the management of fitness centres of different sizes. Managers are often the subjects for studies and different approaches are applied for the analysis of data (Garcia *et al*., 2011). Bower (2008a, 2008b) provided information on the career and counselling women seeking to attain a management position in a fitness centre.

Segmentation

Authors such as Woolf (2008) argue the necessity of knowing the users of the fitness centres with the idea of offering a service adapted to their needs. He raises the service packages as a competitive advantage within the industry of fitness and asserts that the gyms can apply marketing strategies by developing different packages with complementary services that are more personalised and based on the profiles of consumers. Teixeira and Correia (2009) segment customers of fitness centres on the Island of Madeira (Portugal) by classifying them into happy, unhappy and unmarried without loyalty to the club. This proved to be of interest particularly in relation to the specialisation of the centres and strategies of loyalty toward the users. In another line of investigation, Mischler *et al*. (2009) emphasise the relationship between the fitness services and profiles of managers. As claimed by these authors, the manager of a fitness centre plays a key role in the company and the method of management of the centre would depend largely on the profile of the owner or manager, as the dynamic and nature of management is derived from the balance between reason and passion of managers.

Sociological aspects

There has been a steady growth in interest in sociological aspects in the literature. In the leisure and sport sector and the concern for quality of life, several authors have analysed the evolution of the fitness industry, as it has adapted to the needs and demands of the users (Van-Hilvoorde, 2008). For its part, Howell and Ingham (2001) analysed the concept of lifestyle that was mobilised in the debate on health care in the United States.

Other researchers focused their study on certain sectors of the population. Dobbins *et al*. (2012) studied the agreement drawn up between the Louisiana State University Health Sciences Centre-Shreveport and a local franchise of the chain of fitness centres, *Curves International*, whose purpose it was to satisfy the concerns of women, who are known to use different ways to search for information on health. Madeson *et al*. (2010) developed their work with the intention to learn from the experiences of women with personal trainers. They concluded that women valued these experiences positively and that it depended on the motivation, the results achieved, the qualities of the coach and their relationship.

Another study examined the Muslim population from the point of view of integration (Shavit & Wiesenbach, 2012). In the article by Leshkowich (2008), the case of a female fitness centre in a middle class area in Ho Chi Minh City (Vietnam), is presented and how the trend in the frequency of use of partners changed the following of fashion and the process of transforming their body. As a result, the fitness centre adapted to new trends and the evolution of female stereotypes in order to not lose the market share.

Research findings have demonstrated differences between male and female ideals. Harris and Marandi (2002) assert that men, in general, aim to be muscular and women work towards having thin bodies and being supple. However, the research aimed to examine whether gender is an aspect of mediation in the construction of long-term relationships with clients in the sector of health and fitness. With regard to the identification of these physical ideals, authors, such as Frew and McGillivray (2005), claim that these ideals are highly influenced by the state of modern consumerism and the media by identifying trends at fitness centres.

From the perspectives within the concepts of health and quality of life in fitness centres, Reverter and Barbany (2007) found that the sector has evolved, transforming itself from the physical fitness and exercise angle to a concept mostly related to leisure and health. Smith-

Maguire (2001) argues that the structure and organisation of personal training determine the manner in which fitness is sold and what type of physical activity is offered at the centre. Whatever is possible is influenced by the training and qualifications of these professionals.

Other investigations like those by Liu (2007) and Tian-Ping (2007) evaluated this sector in China. There is an over-saturation of the market of fitness centres in the northwest area of China (Tian-Ping, 2007). Tian-Ping (2007) argues that only the big chains survive and make profit. Within the dynamics of survival in competitive markets, Fallon (2004) makes proposals for the future of the fitness industry that are perfectly reconcilable according to Kurscheidt *et al*. (2003). Social networks have been formed at the fitness centres (Crossley, 2008). The formation of the social capital of its members brings a high level of integration between some of the members. Finally, Parviainen (2011) conducted a case study of the program *Les Mills Fitness*, which is a service industry of fitness that normalises body movements in order to obtain benefits. This reflects on the fitness industry and the effect it has on the interaction between teachers and fitness clients.

Other

Studies with a research purpose not falling within the themes previously mentioned are categorised as 'others'. Huddleston *et al*. (2012) examined the relationship between employees' perceptions on the motivational climate in its fitness centre, their intrinsic motivation toward exercise, and their perception of the concern for its pattern of health behaviours. Another line of research was followed by Kenworthy and Hrivnak (2012), who propose and analyse the use of a workout in the gymnasium as an introduction to the research on the relationship between the physical and mental state. On the other hand, Santos *et al*. (2011) devised a tool for the identification and analysis of the competencies and strategic resources in service operations.

The use of automated external defibrillators in the management of risk and liability of the fitness centres was of interest to Sekendiz and Quick (2011). In line with this, Norton and Norton (2008) report that there are no laws in Australia that would compel the fitness centres to install them, however, they consider it advisable to account for these defibrillators in the larger centres and in states where there are high-risk groups. From the perspective of a fitness centre as a business, Parrot (1996) based the strategies followed by the hospitals on five principles to achieve success, namely: understand the importance of the strategic business of fitness for the organisation of health care; know the customer; offer a differentiated product;

hire the best qualified; and be a smart seller. Forrester and Upton (1994) made a contribution by suggesting an audit program that provides ease in its use for measuring and improving the safety and health performance in fitness centres.

CONCLUSION AND RECOMMENDATIONS

This work makes a contribution to the body of knowledge with this review of literature on research related to the management and marketing of fitness centres. The present study could assist researchers and practitioners alike to familiarise themselves with the extent of the work published in the more relevant data bases. In the publications analysed in this study, there seems to be a greater interest in the topics related to quality, satisfaction and loyalty, as well as human resource management and sociological aspects. However, the topics of

organisational culture, innovation, sporting facilities and segmentation were less common. Subsequently, the studies that make up the present revision suggest the importance of analysing those aspects which could impact on customer loyalty, one of the major problems of the fitness industry. Nonetheless, the investigation had some limitations. The first is related to the number of data bases used which the researchers could perhaps have expanded to include more articles. In addition, the two search terms utilised may have omitted articles that could have been relevant and of interest. Therefore, for future investigations, it is recommended that the consulted databases and search terms be increased.

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WOMEN AND SPORT LEADERSHIP: PERCEPTIONS OF MALAWI WOMEN EDUCATED IN SPORT BUSINESS LEADERSHIP

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ABSTRACT

Traditional beliefs, cultural expectations and attitudes regarding the position of women in society still exist in the sub-Saharan African patrimonial society. Gender inequality in Africa's regional and national sport organisations and governance structures is a reality and empirical work on women in sport leadership is lacking. This qualitative investigation is embedded in social constructivism as conceptual framework, which attempted to explore the perceived effect of a sport leadership education program in Malawi. The effect of leadership education is contextually perceived and although the challenge to integrate African leadership and traditional western leadership models is recognised, it was not the aim of this study. The study aimed to understand the leadership experiences of females in a Malawi sport context and sought to reveal if sport leadership development initiatives like this are expected to be merely opportunities to transfer knowledge or if it could affect the self-worth

and "voice" of female sport leaders in Malawi. Findings suggest that completing the sport leadership education programme positively affected not only individual self-worth but also the collective voice of female sport leaders. It is proposed that similar courses are expanded and introduced to other sub-Saharan African countries and to research the perceived effect.

Key words: Sport leadership education; Gender inequality; Sub-Saharan Africa.

INTRODUCTION AND LITERATURE REVIEW

A depressing picture of leadership in Africa is often presented in extant scholarly literature (Kiamba, 2008; Bolden & Kirk, 2009; Muchiri, 2011; Ngambi, 2011; Walumbwa *et al.*, 2011). Researchers (Mboup, 2008; Bolden & Kirk 2009; Haruna 2009; Kuada, 2010; Muchiri, 2011), recognise that much of the discourse and research on leadership in sub-Saharan Africa focuses on leader characteristics, skills, styles and behaviour from a western perspective, while the contextual realities of sub-Saharan African leadership are often negated. Leadership does not occur in a vacuum, and the above researchers strongly argue for leadership approaches that develop Africa's social and human capital.

Understanding the dynamics and characteristics of leadership in Africa and the status of women in this context are at the heart of this study. Women constitute a significant part of the social and human capital of Africa. In Africa, and specifically sub-Saharan Africa, patriarchal

structures dominate the lives of individuals, governance and political systems (De la Rey, 2005; Pandor, 2006; Kiamba, 2008), and influence the way in which people, especially women in Africa, have access and opportunity to leadership positions. Although a number of sub-Saharan African countries have adopted progressive constitutions resulting in policies and quotas on gender equality, prejudice against women in leadership positions persists (Aubrey, 2001; Bolden & Kirk, 2009; Nkomo & Ngambi, 2009; Kuada, 2010; Dibie & Dibie, 2012), creating a gap between intention and implementation. Scholars (Kiamba, 2008; Kuada, 2010; Dibie & Dibie, 2012), agree that gender inequality in Africa is defined and driven by traditional cultures and patriarchal ideology. This reality is also observed in sport leadership as an area of public life.

Sadie (cited in Kiamba, 2008) isolated various factors limiting aspirations to positions of leadership for women in sub-Saharan Africa. The patriarchal system, where decision-making power resides in the hands of males, seems to be a fundamental constraint. Traditional beliefs, cultural expectations and attitudes regarding the position of women in society still exist on the African context. Many African women aspiring to leadership positions in sport are reluctant to distance themselves from tradition and culture out of fear of social exclusion. In general, the traditional roles of women are seen as homemakers and domestic caretakers.

Decision-making and leadership capabilities are typically limited to the domestic sphere. Decision-making and visibility in public life, such as sport organisations, are frowned upon as it implies women have to juggle cultural expectations with their cultural leadership roles. In her study on experiences of women in sport leadership in Kenya, M'Mbaha (2012) pointed out that despite women's sport policy resolutions of the International Olympic Committee, women in Africa tend not to offer themselves for leadership positions due to a fear of social exclusion. Globally, only 12.4% women had been recruited to serve on national Olympic

committees. In Kenya (15%) and Malawi (3%) of women are underrepresented in sport governance structures across management levels.

The role of the media, socialisation of the girl child and stereotyping are also highlighted by Sadie (cited in Kiamba, 2008), as contributing factors to leadership equality in Africa. Lack of media coverage of women in sport leadership positions contributes to creating a void in female role models. Tamir and Galily (2010) postulate that inadequate media coverage makes women in African sport invisible. This obviously does not benefit the agenda of women in sport, as it relates to equal access. M'Mbaha (2012) reports that women in Kenya often prefer to avoid the media. An unintended consequence of this is the lack of recognition of female sport leaders in the media and the further marginalisation of women in sport leadership. The socialisation of the girl child also contributes to gender inequalities in leadership. Girls are not nurtured for leadership positions in society through rites and rituals on the same level as a boy child. Emmet (cited in Kiamba, 2008) attributes this to some religious practices that tend to cement cultural norms and practices and, consequently, disempower women and girls.

Gender stereotyping seems to be another major cause of persistent under-representation of women in leadership positions. Socio-cultural practices and traditions render women and girls as jural minors falling under the guardianship, first of their fathers and later of their husbands and discourage women to seek leadership positions in society (Sudarkasa, 1986). A consequence of this is a lack of leadership networks and recognition of ability and visibility

in society needed for leadership advancement. Marital status, social background and family responsibilities contribute to the social cost of the decision to get involved in leadership positions in Africa. For some women, this social cost is often too high to contemplate.

Gender and leadership inequality is evident throughout the history of Malawi. Its peak was under the leadership of President Hastings Kumusu Banda from independence to the early 1990s. According to Tiessen (2008:201), Banda had a special relationship with Malawian women as he referred to them as "his women" which cemented their subservience in society. One of the roles expected from Malawian women under the leadership of Banda was compulsory traditional singing, dancing and praising the ruling political party. Banda described himself as the male leader of the women in Malawi, thereby institutionalising traditional leadership roles and limiting decision-making authority of women (Tiessen, 2008). In her research, Tiessen (2008) echoed the concerns of Kiamba (2008) about attitudes and barriers towards women in leadership positions in sub-Saharan Africa. The concern of women being their own enemies in leadership advancement in Malawi emerged as a common theme in the work of Tiessen (2008). She argued that barriers to leadership advancement, capacity building and equality are not solely contributed to a lack of support of men; women also prevent other women from reaching and succeeding in leadership positions.

The 1994 referendum ended one-party rule in Malawi and a new constitution in which gender equality for women with men and the rights of women emerged. The Constitution guarantees full participation in all spheres of society in Malawi [including sport], and states that all customs and practices that discriminate against women in work and public affairs are eliminated. Under the current Constitution, all citizens of Malawi are offered greater access to higher learning and continuing education (Constitution of the Republic of Malawi, 2006). Despite the above fundamental principles of the Constitution of Malawi, female participation rates in sport are relatively low compared to that of males. It is estimated that around 30% of

the women take part in sport over their lifespan, while less than 3% of females are involved in sport leadership structures in Malawi (Malawi National Sports Council, 2014). These relatively low participation figures could be contributed to the strong influence of societal practices and customs, despite the underlying gender equality opportunities articulated in the Constitution of the Republic of Malawi.

Strategies of the Malawi National Sports Council (MNSC) to provide access and opportunity to education advancement and leadership and public decision-making spaces for Malawian women through sport business management and leadership courses and appointment of female sport officials in representative positions in Malawi sport do, however, reflect congruence with the principles of the Constitution of the Republic of Malawi. The significance of empowering women in African society with education, technical skills, enhanced self-worth and economic independence that could lead toward equality and full-participation in society is in line with the findings of Dibie and Dibie (2012) on leadership development for women in Africa. Efforts like this, however, must go hand in hand with changes in the attitude towards gender equality in sport leadership as public space. The results of this study could contribute towards an understanding of gender inequality in Malawian sport management and leadership.

The significance and need for women to be involved in decision-making and leadership in Africa were debated extensively in an online discussion (United Nations, 2007), organised by the Division for the Advancement of Women of the United Nations Department of Economic and Social Affairs and the United Nations Economic Commission for Africa. What emerged from this discussion was the importance of the involvement of women in societal decision-making. Contributors emphasised that without the active involvement of women and the incorporation of women's perspectives at all levels and spheres of decision-making, the goals of equality, development and peace cannot be achieved. Women in leadership roles are more likely to represent the needs and interests of other women and act as role models to the next generations of girls and boys in African society.

Gender inequality in Africa's regional and national sport organisations and governance structures is a reality. Females remain marginal in decision-making in sport contexts despite ratio guidelines from international sport governing bodies and governments. Gender inequality in sport leadership is, however, not uniquely African. It is a global phenomenon that continuously receives attention on global and regional platforms. Hargreaves (1997) reported on the general absence of women in decision-making positions in South African sport. She ascribes this to deep-seated power imbalances between men and women in South African sport. She argues that as there is very little willingness among men to strive towards and institutionalise gender equality in social institutions, this tendency is likely to continue. Pelak (2010) reports a similar trend of gender inequality in South African soccer from 1970 to 2010. Pelak (2005) does, however, state that the growth of women's soccer in South Africa, and especially in the Western Province region, provides a challenge to gender exclusionary practices in soccer. This has contributed to the tenacity of female soccer players and their supporters. Elsewhere in Africa the trend of gender equality in sport is also reflected in the scope of media coverage of sport in Nigeria (Ajibua *et al*., 2013).

According to Ajibua *et al*. (2013), the quality and quantity of media coverage of female sport in Nigeria is not an accurate reflection of the level of achievement in Nigerian sport and attributes the reality in Nigeria to a lack of women in decision-making positions in the sport

media profession. In addition, structures such as UNESCO, the International Olympic Committee, the International Association of Physical Education and Sport for Girls and Women, the International Council of Health, Physical Education, Recreation, Sport and Dance, the International Council of Sport Science and Physical Education, MINEPS, European Union, Sports Association of Arab Women, Supreme Council of Sport in Africa, Asian Women and Sport Group, USA Women's Sport Foundation and the International Women's Group, continuously advocate for gender equality in sport (Kluka, 2008).

In her research, Kluka (2008) reported that for decades women have been disadvantaged by being afforded relatively limited access to active participation in sport at all levels. Women have also been absent in decision-making roles due to a lack of gender mainstreaming policies, development initiatives and education programmes aimed at facilitating women's participation in global sport. Kluka (2008) pointed out that although global and regional policies and declarations on gender inequality span several decades from the United Nations' universal declaration on human rights (United Nations, 1948), to the 2013 Cuba declaration on Moving Girls and Women Forward Towards a Better World (International Association of Physical Education for Girls and Women, 2013), gender inequality in sport still persists on a

global scale. Education and development of the leadership potential of women to increase self-worth and skills profiles are central concepts in the majority of declarations and policy documents on women and sport.

CONCEPTUAL FRAMEWORK

The conceptual framework for this study draws on the theory of social constructivism. According to Vygotski (1978), the founder of social constructivism as a departure from the cognitive constructivism views of Piaget, all of the cognitive functions, for example, learning, decision-making and leadership behaviour originate in collaborative, human social interactions and must, therefore, be explained as products of social interactions. New knowledge and social behaviour are not simply assimilated through cognitive memory but also by being integrated into a community where the individual creates subjective meaning of their experiences and model behaviour through collaborative human interaction in communities. The cultural context within which human interaction takes place is fundamental. According to the social constructivism theory, behaviour and choices of the individual in life are determined by collaborative customs and knowledge.

According to Coakley (2007), sport is a social construction. As such the paradigms and significance societies attribute to sport are influenced by cultural ideology. Ideologies reflect ways in which people give meaning to gender equality and the position of women in sport. When leadership in Africa is thus approached through the lens of social constructivism, as well as cultural ideology, the influence of the patriarchal cultural system becomes evident and cultural beliefs that define gender positions in sport are accepted as normal practice. In the patriarchal system traditional beliefs, cultural expectations and attitudes regarding the position of women in society dominate and model social human interaction. The aspirations to leadership positions in sport governance structures of female sport leaders are, therefore, competing with cultural customs, norms and values regarding female leadership across and between societal spheres despite the principles of the Malawi Constitution.

RESEARCH CONTEXT

This investigation explored the context of a sport leadership education program in the sub-Saharan African country of Malawi. The researchers were especially interested in understanding the leadership experiences of females in Malawi sport. The researchers also sought to reveal if sport leadership development initiatives like this are expected to be merely opportunities to transfer knowledge or if it could contribute to the self-worth and "voice" of female sport leaders in Malawi. The researchers acknowledge that a sport leadership course is merely an educational event and do not claim that a single event could eradicate deep-rooted social inequality in Malawian society. The results of this study, however, could provide insights to investigate themes for future assessments of sustainable social impact. The reality of inequality in sport in Malawi became imminent from the profile of the first two cohorts of a Certificate and Advanced Certificate in Sport Business Management. Only nine females (N=9) were recruited in the first two cohorts (N=56) of a Certificate and Advanced Certificate in Sport Business Management development programmes funded by the Malawi National Sports Council (MNSC). The population of nine female participants served as the purposive sample.

The two sport leadership programmes were presented to a cohort of 56 participants in Malawi by a team of facilitators with teaching experience in Africa from a South African and an American university. The sport leadership development programmes involved in-country application and recruitment, in-country launch and in-country teaching programmes comprising five modules for each certificate over 12 months with a five-day contact session in Malawi after the second module. Module content was developed in consultation with the MNSC to reflect the social demands and parameters of sport in Malawi. Based on the contextual requirements of sport in Malawi and the brief from the MNSC, the Certificate for Sport Business Management modules were developed for fundamental sport management, sport facility and event management, sport marketing, sport leadership and governance and sport development.

Modules for the Advanced Certificate in Sport Business Management included Visionary management in sport, Sport finances, Human resource management in sport, Contemporary business processes in sport, Legal and political processes in sport and Managing sport science and coaching science issues in sport. Comprehensive course manuals were compiled and provided to enrolled candidates founded on the guiding principles of continuing and distance education, adult and interactive learning. A feature of this particular sport leadership development programme was interactive individual and group assignment activities requiring candidates to engage with sport governance structures, sport events and sport facilities to apply theoretical knowledge and experience leadership dynamics in the socio-economic context of Malawi.

RESEARCH METHODS

The research had a qualitative, narrative approach to gain insight into the perceived effect on female sport leaders attending the particular sport business management and leadership courses. This qualitative research relied on a range of data collections that enabled an inductive understanding and interpretation of ways in which females experience their involvement in sport leadership and the perceived effect on their self-worth, personal enrichment and influence in the Malawi sportscape. In this study data were collected from female respondents in the following ways:

1. *Online semi-structured questionnaire* administered to all female candidates (N=9) in the first two cohorts of the Certificate and Advanced Certificate in Sport Business Management programmes. Respondents were invited to share their written narrative experiences as females in Malawi sport and reflect upon their personal history of participation and leadership in sport, narratives on their lived experiences and challenges in sport leadership, their perceptions on the potential role of women as change agents in Malawi sport and the perceived effect the leadership courses had on them.

2. *Follow-up semi-structured personal interviews* with respondents to explore their narratives, as well as their lived-experiences in the Malawi sportscape after completing the Sport Business Management development programmes. Interviews were recorded with the informed consent of the respondents. Time available for collecting data through these personal interviews was limited to a scheduled one-week contact session in Malawi.

3. *Community visits and respondent observation* where respondents were observed during their engagement with sport clubs in the community and at sport events and facilities after completion of the courses. Observation focused on indications of assertiveness in meetings, interaction with male counterparts, willingness to speak out in task groups and meetings, knowledgeable and assertive debating of contentious issues, willingness to take leadership in sport events and facility contexts, positively questioning proposals and decisions in meetings and willingness to support other females in meetings. Personal observations were geographically limited to areas surrounding the cities of Lilongwe and Blantyre, although respondents represented the total geographical area of Malawi. Field notes were taken independently during the observation of respondents in meetings and sport leadership contexts.

Collected data were analysed and interpreted through the theoretical lens of social constructivism. An inductive approach was implemented where the researchers first intensively analysed and interpreted narratives independently to maintain trustworthiness of collected data. Key themes, issues and emerging patterns were identified, coded, reflected upon and interpreted independently followed by a mutual process of verification and consolidation. The qualitative software programme *Atlas ti* was applied to code the data. Triangulation of data took place by comparing the data collected through narratives and semi-structured personal interviews with observations. Analysis of secondary sources provided insight into the theoretical framework of women in leadership in sub-Saharan Africa. Although both researchers were white and female, they were known to respondents as both have been involved in the development and delivery of the sport management and leadership courses since its inception in Malawi.

FINDINGS AND DISCUSSION

In the following section the main issues relating to the experiences of females in Malawi sport are presented. As the research took a narrative approach, it provided a safe space for respondents to share their perceptions, expectations and experiences in sport leadership in Malawi, as well as to reflect on the perceived quality of the sport business management leadership courses and the potential effect of these courses on self-worth. Following the initial independent analysis of the narratives by the researchers, the following broad themes were induced: (1) status and value of women in sport leadership in Malawi; (2) barriers and

challenges for women to enact sport leadership in Malawi; (3) effect of the leadership education courses on their voice/influence in sport; (4) effect on networking abilities and opportunities in Malawi sport; (5) women's role as social change agents through sport in Malawi; and (6) effect of the sport leadership courses on self-worth and career vision. Triangulation of themes through follow-up personal semi-structured interviews and observation of women enacting sport leadership in Malawi added three additional themes: (7) strategies to improve women's voices in Malawi sport; (8) involvement in and passion for sport; and (9) perceived shifts in leadership perceptions and experiences of female sport leaders in Malawi.

Status and value of women in sport leadership in Malawi

The status and value attached to women in sport leadership greatly mirrored the status and value of women in Malawi society and greater sub-Saharan Africa. There was unanimous

agreement among respondents that, in general, women are not valued in sport leadership, and are under-represented in sport governance structures. This finding mirrors the Malawi reality of less than 3% women being involved in leadership positions in sport governance structures. According to the MNSC, this seems to be a trend across Malawi sport structures. Specific figures of female leadership involvement across sporting codes were not available due to a lack of research and knowledge management systems of individual sporting codes. This trend, however, is in line with findings reported by M'Mbaha (2012) on female sport leadership in Kenya. Women aspire to positions, but men monopolise positions even in sport governing bodies for girls and women, such as netball. In terms of the theory of social constructivism Malawian society follows a patriarchal structure.

Despite gender equality advocated in the Constitution of Malawi, leadership roles are to a great extent taken up by males across public social spheres. The findings of Muchiri (2011) that highlight the influence of social constructivism factors constraining leadership opportunities in African society, are also supported by the results of the present study. Access to education opportunities was identified by Dibie and Dibie (2012), as contributing to gender equality in sub-Saharan Africa. In their narratives, a number of respondents contributed the low value and status of women in sport leadership to a lack of formal education opportunities in sport management and leadership in Malawi, thus, reiterating the findings of Dibie and Dibie (2012) on the significance of access to education opportunities. These findings were anticipated against the context of Malawi's male-dominant society where women are regarded as subservient to males in public spaces such as sport. The perceived gap between the intention of Malawi's constitution on gender equality and implementation and acceptance in society is reinforced by these findings.

Barriers and challenges for women to enact sport leadership in Malawi

Social barriers against women in leadership in the broader society of Malawi correspond with findings in the research of Kiamba (2008) and Tiessen (2008), and is reinforced by the results of this study. Three sub-themes emerged from the narratives: women being their own enemies; cultural barriers; and societal perceptions. The concern of women being their own enemies in leadership advancement in Malawi emerged as a common theme in the work of Tiessen (2008). A similar concern was voiced by the respondents in the current study. One respondent referred to this as the *"PhD syndrome"* ("Pull her Down"), prevalent among women in sport leadership positions.

In the analysis of the narratives it was not clear if this behaviour is mimicking the behaviour of male sport leaders or if it is gender related. Concepts, such as jealousy, gossiping, lack of support for and recognition of other women, and self-centredness surfaced in the narratives. If women strive to achieve a critical mass in sport leadership in order to institutionalise the voices of women in sport and act as role models to the aspirations of a younger generation of women and girls, this tendency is clearly counter-productive to the advancement of women in sport leadership.

As the context of leadership in sport represents a sub-set of the context of leadership in Malawi society, it was expected that the narratives would be filtered through with the dominant patriarchal cultural norms and values. The value of sport in Malawi is highly

appreciated and recognised, but at the same time claimed as the male domain. Although respondents were unanimous in their convictions that women's leadership in sport can add value and dimension to sport governance structures, they were very reluctant to articulate views against cultural norms and values. Some respondents stated that although covertly they do not agree, they do not want to overtly challenge men's traditional authority not only in society, but also in sport as a public space of leadership as it would reflect badly on them as women, wives and mothers. The physical nature of sport participation and sport apparel worn present barriers from a religious perspective, particularly in the Muslim community of Malawi. Women and girls wearing shorts are sometimes perceived as prostitutes, an activity considered illegal in the social context of Malawi. In rural areas particularly, parents are not willing to release their female children from household chores and duties to participate in sport, as the survival of the family depends upon those household duties of cooking, nurturing children and fetching water.

The majority of girls, therefore, have no history of involvement in sport participation, which is regarded as a platform for aspiration to sport leadership positions in later life. Women do not only have to contend with men's antagonism, dominance and sexism within sport leadership structures, but also with perceptions of the broader society. Narratives emphasised society's perceptions of sexual connotations attributed to women in sport leadership. Society perceives women serving in sport leadership positions as opportunists labelling them as only interested in men; that they are there for the pleasure of men and are described as *"loose"* women. Respondents referred to these as follows:

> Married women serving in sport governance boards are not favoured by men serving on the same boards, as it limits their [women's] sexual availability.
>
> I served on the committee of a sport club as ex-officio member and the men on the committee made fun of my inputs and made indecent propositions to me, which was very funny to them.

At the same time, married women among the respondents of this study indicated that they are reluctant to serve on sport governing boards, as it could jeopardise their marriages and social status in the community. Narrative comments in this regard state:

> Although I love netball, I do not want to get involved in sport club management as my husband and family say I should spend more time at home taking care of him and our household.

The contextual influence of leadership hierarchies constraining the efficacy of female leadership, as debated by Muchiri (2011), is mirrored in the narratives of respondents. Suggestions on how to address these barriers came from some respondents:

> We have to collectively stand strong against the sexual suggestions of men in committees. If women stand together we can show them we want to improve the sport and not go to bed with them.

Effect of sport leadership education courses on the collective voice/influence of women in Malawi Sport

The notion of a collective voice is echoed in this theme. Although women identified barriers they also agreed that they feel more empowered after completing the courses. The positive and empowering shifts experienced in self and career vision perceived by the respondents

elevated the collective voice of women in Malawi sport. Respondents not only reported increased involvement and influence in decision-making in their immediate personal environment, but also in the wider Malawi sport community. In the words of one respondent:

> I have been asked many times now to represent Malawi on women's issues in our region (Africa) and was appointed as [national representative] for the 2012 London Olympic Games, as I can now act from a position of authority due to my increased knowledge. I also influenced associations to allow women and girls to participate in regional competitions to showcase women's potential. I played a crucial role in influencing sport development in my local community and the entire community.

The perceived value of increased knowledge through education is reflected in the above narration. This reiterates the findings of Dibie and Dibie (2012) on the power of leadership education for women in Africa. Another respondent expressed her perceptions in this regard as follows:

> I was a lonely voice in my area. I did not always feel confident to debate issues as I felt I did not know enough. At regional events I now feel more confident to speak because I know I have other women to support me.

The above statement suggests that respondents perceive their potential influence in Malawi sport not limited to their immediate environment, but also transferable to a broader context.

Effect on networking abilities and opportunities in Malawi sport

In order to influence and change the perceptions of society in Malawi on the status and position of women and girls in sport, social change agents [women in sport] need to network. Respondents reported positively on the impact of the sport leadership courses on their networking abilities and opportunities. Two primary reasons were cited: (1) improved concept of self; and (2) the nature of the course and assignments. Recruitment for the sport leadership courses was done publicly at the national level in Malawi resulting in successful candidates representing different levels of management in Malawi sport. Selected candidates met with each other for the first time during the scheduled contact lecture weeks. The delivery strategy and course methodology focused strongly on personal interaction and group work to complete assignments.

The profile of the candidates brought people from diverse sporting backgrounds, governance levels and opinions together and provided opportunity to network with government officials, sport organisations and influential male individuals in Malawi sport. Candidates were required to attend sport governing board meetings, interview sport managers, sport personalities and sport participants to complete some of the assignments. Their increased levels of confidence gained from the safe learning environment of the course allowed them to develop networks, become visible, and earn recognition in a broader community context for

their contributions. One respondent expressed her feelings on networking as follows:

> During the course I was in a discussion group with officials from the Ministry [of Youth and Sport] and national sport organisations. That provided me with the chance to communicate face-to-face with them. It was the first time I had the opportunity to approach them directly and discuss issues. It opened new communication channels.

These narratives demonstrate the element of walking together in Kirk's (2005) model of system leadership development. Networking creates safe spaces for women to connect and reach out to others, thus, progressing together towards the goal of becoming more visible within the Malawi sportscape.

Perceived effect on women's roles as social change agents through sport in Malawi

Bolden and Kirk (2006) postulated, based upon the theory of social constructivism, that how people think of leadership affects how social systems operate, which consequently affects the well-being of the social system and the people in it. From their narratives, it was clear that respondents understood the influence of patriarchal leadership on society's [negative] perceptions on women in sport. Society endorses the leadership views on gender equality although it contradicts the Malawi Constitution. It also became evident that respondents were convinced that through strong bridging social capital networking between diverse individuals, sporting codes and leadership levels, role modelling, advocacy and dialogue, they could leverage the impact of sport to collectively influence social perceptions of women in Malawi sport. This particular finding aligns with the elements of Kirk's (2005) model of system leadership development that facilitates social change in communities through seeing together (role modelling and mentorship), walking together (networking and advocacy) and talking together (dialogue). Respondents intuitively proposed and embraced a communal view of leadership whereby the collective empowerment of women and girls in rural areas through sport could bring about a chain reaction regarding patriarchal views on women in sport.

A fundamental starting point in Kirk's (2005) model is the notion of an improved self, which was a requirement respondents reported on positively through their narratives. They, however, did not perceive the effect of the sport leadership program only as individual skills development, but transferred their newly acquired skills set to the collective cause of raising awareness for women in sport. Higher perceptions of self-confidence and self-worth of respondents provided them with the courage and tools to share and exchange ideas on women in sport in a broader community context. Bolden and Kirk (2006) reported similar findings through their InterAction leadership program in a Pan-African context.

Effect of the sport management and leadership courses on self and career vision

Without exception, in their narratives and follow-up interviews respondents reported a significant perceived positive impact and influence on self and their career vision. A definite pattern of developed self-confidence, increased feelings of self-worth, assertiveness, influence and authority, based on improved sport leadership competencies and capabilities was voiced in the narratives. In this regard, the results of the current study support the contention of Dibie and Dibie (2012) that empowering women in African society with education could lead to enhanced self-worth and fuller participation in society. It also falls in line with the argument of Ngambi (2011) that increased feelings of self-awareness and the ability to pro-actively develop personal strengths and weaknesses are significant elements of

building leadership capacity.

Respondents reported acquiring good solid sport leadership skills that enabled them to act as excellent role models to the female sport sorority in Malawi. Respondents experienced increased feelings of self-worth in that their acquired knowledge and skills enabled them to now act from positions of authority. A number of respondents commented on their initial apprehension of perceiving not to have the intellectual ability to complete the courses

successfully as, according to society norms and expectations, women's roles and capabilities were limited to the family household. Being able to successfully complete the courses made them feel empowered as women. Respondents acknowledged a sharp focus in their career vision. The possibility of a full-time career in sport leadership and management became viable options as they perceived and understood their collective voices and influence as role models for gender equality in women's sport in Malawi. One respondent worded the influence on her career vision as follows:

> I completed the certificates despite my initial feelings of doubt. I can see that I can follow this path to more education.

Strategies to raise collective awareness of women in Malawi sport

The power of a collective voice was hinted at by respondents in their narratives on barriers hindering full equitable participation in Malawi sport. Their new vision of and belief in their influence in the male-dominated Malawi society was reflected in strategies proposed by them to strengthen their collective voice in sport. Proposed strategies could be categorised into three focus areas: Mentorship and role modelling; access; and opportunity to sport leadership education and advocacy. Respondents expressed strong feelings about women in sport being role models to others and being able to speak out on behalf of the voiceless. Through mentorship between women, who successfully completed the sport leadership education course, and aspiring female sport leaders in Malawi, the value of sport for women and girls might be institutionalised in rural areas to create a critical mass influencing patriarchal social expectations of women and girls in sport. Respondents voiced realistic opinions on access and opportunity to sport leadership education.

The significance of involvement in local sport governance structures as platform for regional and national involvement was emphasised. Women and girls could be educated as coaches and referees on local level to build self-confidence and assertiveness. Without exception, respondents underlined the necessity to deploy participants, who successfully completed the sport management and leadership courses, in government sport structures to reinforce role modelling. Sport as a vehicle to advocate for implementation of the 50-50 principle (gender equality) as imbedded in the Malawi Constitution, was stressed by respondents.

Involvement and passion for sport

All respondents had completed high school education (Grade 12) and the majority (62.1%) had higher education qualifications as teachers in areas other than sport. As the Malawi higher education system does not offer any formal qualification in the areas of sport science, respondents kept their passion for sport alive through volunteerism in sport. They volunteered as administrators, assistants to male coaches and referees on lower levels of sport. Without exception, respondents emphasised the importance of involvement in sport participation from an early age but limited to the sports of soccer and netball. Motivation for participation in

sport was both intrinsic and extrinsic. Intrinsic motivation is reflected in a narrative stating:

> I love doing sport. I love the movement, it makes me feel good.

The extrinsic influence of female teachers and mothers as role models, motivators and mentors was evident as one respondent reported:

> I was raised by my mother to believe that I have the potential to be the best I can be.

Continued involvement and performance in sport participation and volunteer leadership increased their visibility in sport and created a desire to aspire for institutionalised leadership positions in Malawi sport governance on local, regional and national level. Nominations to be elected to sport governance structures again provided external motivators. None of the respondents, however, referred to intrinsic motivators, such as self-confidence, leadership skills profile, self-worth or personal goals pulling them towards possible governance positions in Malawi sport.

Perceived shifts in leadership perceptions and experiences of female sport leaders in Malawi

Observing respondents in sport leadership contexts after completion of the leadership programmes, it became evident that they presented themselves confidently and assertively. Respondents attributed this to their exposure to the leadership courses.

TABLE 1. **PERCEIVED SHIFTS IN LEADERSHIP PERCEPTIONS AND EXPERIENCES OF FEMALE SPORT LEADERS IN MALAWI**

From…	To…

Non-recognition and under-representation and marginalisation in sport governance structures	Recognition and inclusion albeit still marginal
Exclusion from sport leadership education opportunities	Access and opportunity to sport leadership education
No platform for aspiring to sport leadership opportunities	Platform provided to support sport leadership aspirations
Feelings of low self-worth	Increased feelings of self-worth and self-confidence
Lack of career vision in sport	Clearer and improved career vision in sport
Lack of intellectual capacity to succeed	Intellectual empowerment
Limited understanding of personal strengths and weaknesses	Pro-actively developing personal strengths and weaknesses
Isolated influence in sport	Elevated collective voice & role models in Malawi sport
Marginal and localised decision-making influence in Malawi sport governing contexts	Increased influence in decision-making in broader Malawi sport governing contexts
Limited identity as sport leaders in Malawi sport	Reconstructed identities as mentors and role models in Malawi sport
Limited tools and competence to share and exchange ideas on women in sport	Realistic and relevant skills and tools to debate the issue of women in sport in Malawi
Localised networking opportunities and skills	National and increased networking abilities and opportunities
Almost invisible in Malawi sport governing structures	Increased visibility and influence in Malawi sport governing structures

Observations focused on indications of assertiveness in meetings, willingness to speak out in task groups and meetings, knowledgeable and assertive debating of contentious issues, the willingness to take leadership in event organising meetings, positively questioning proposals and decisions, and willingness to support other females in meetings. Observed behaviour corresponded with narrative statements of respondents in terms of the perceived influence the sport leadership courses had on them.

Bolden and Kirk (2009) in their investigation on new understandings of African leadership concluded that the willingness of females to take up leadership positions and their ultimate active leadership involvement are shaped and influenced by traditional views informed by cultural and religious norms. Leadership roles of females are acted out within a community context. As such, female sport leaders in Malawi need to find a balance between personal aspirations and values and societal values. Access and opportunity to the sport leadership development programs presented in Malawi seemed to contribute to a shift in perceptions of the respondents, understanding and appreciation of their personal leadership competency and their collective voice in Malawi sport. An overview of this perceived shift as interpreted from the collected data can be found in Table 1.

CONCLUSIONS AND RECOMMENDATIONS

This qualitative investigation provided an opportunity to explore leadership perceptions of female candidates in the first two cohorts of a sport leadership development program in Malawi. Results confirmed the powerful influence of societal contexts in sub-Saharan Africa

on the status and role of women in sport leadership. Findings on barriers and challenges experienced by the respondents in a sport context were certainly not new and in line with extant research on leadership in Africa, yet they remain appropriate considering the persistent gender inequality in sport as a microcosm of a broader Malawi society. The positive empowering impact on respondents reported in this research could be transferable to other spheres of society and could provide a significant environment for collective advocacy on the position of girls and women through sport.

The complexity and diversity of sub-Saharan Africa erase the possibility of generic strategies on how to increase access and opportunity for women in sport leadership, so often advocated by international organisations through global declarations, policies and quota systems. The researchers propose that sport leadership education opportunities for females are expanded and introduced to other sub-Saharan African countries through the Supreme Council of Sport in Africa to investigate perceptions of the effect thereof in other cultural contexts. Future research could also explore the compatibility of generic global declarations on women and sport with non-western cultural contexts.

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ASSOCIATION BETWEEN MUSCLE MASS AND A SINGLE MEASUREMENT OF HYPERTENSION IN COMMUNITY-DWELLING ADULTS IN KOREA

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ABSTRACT

Hypertension is a well-known global and social health problem affecting all-cause mortality significantly. It is strongly associated with the risk of heart attack, coronary artery disease, cardiovascular disease, stroke and liver disease. The relationship between muscle mass and a diagnosis of hypertension in a sample of Korean adults (N=225) was investigated. The participants included adults aged >20 years who visited the S-gu Public Health Centre, Seoul, Korea for a medical check-up in 2011. The Joint National Committee on Prevention, Detection, Evaluation and Treatment of High Blood Pressure VII defined hypertension as blood pressure

>140/90 mmHg. The prevalence of hypertension was 28.4% in the present study. The association between muscle mass quartiles was determined using bioelectrical impedance analysis. The presence of hypertension was assessed using multivariate logistic regression analysis adjusted for BMI and self-reported personal demographic and lifestyle information. The odds ratios (95% confidence interval) for each of the quartiles compared to the very low muscle mass quartile were: 0.617 (0.190–2.004, p=0.422) for low muscle mass; 2.564 (0.873–7.531, p=0.087) for high muscle mass; and 2.975 (0.893–9.907, p=0.076) for very high muscle mass. These results indicated that muscle mass was not associated with a single measurement of hypertension in this sample.

Key words: Hypertension, Body Mass Index (BMI), Lean body mass; Muscle mass; Adults; Korea.

INTRODUCTION

According to a report by the World Health Organization in 2013, the global number of people with hypertension increased from 600 million in 1980 to 1 billion in 2008, with approximately 40% of the adults older than 25 years of age living with hypertension (World Health Organization, 2013). In the United States, hypertension was present in 31.7% of men and 32.8% of women aged >20 years in 2011 (National Centre for Health Statistics, 2012). Similarly, a 2011-report in Korea indicated that the prevalence of hypertension in adults older than 30 years was 33.9% in men and 27.8% in women, and these rates are increasing (Korea Ministry of Health and Welfare, 2012). Owing to its strong associations with the risk of heart attack, coronary artery disease, cardiovascular disease, stroke and liver disease, hypertension is a global public health problem (McInnes, 1995; Henriksen & Møller, 2004; World Health Organization, 2011; Korea Ministry of Health and Welfare, 2012; National Centre for Health Statistics, 2012; World Health Organization, 2013).

The risk for hypertension is affected not only by behavioural factors, such as diet, smoking, physical activity and alcohol consumption, but also by globalisation, urbanisation, aging, income, education and housing (World Health Organization, 2013). There are also a number of metabolic factors, such as obesity, diabetes and increased blood lipids, which increase the risk for hypertension (World Health Organization, 2013).

RESEARCH PROBLEM

Recently, evidence has suggested that hypertension is also associated with inflammation (Bautista *et al*., 2005; Stefanadi *et al*., 2010; El Chami & Hassoun, 2012), and inflammation may contribute to hypertension (Libby *et al*., 2002). Furthermore, inflammatory processes may be important contributors to the patho-physiology of hypertension and cardiovascular disease (Savoia & Schiffrin, 2006). The role of the inflammatory system in muscle strength and muscle mass has already been established (Schaap *et al*., 2006; Ruiz *et al*., 2008; Wang *et al*., 2010). Therefore, the authors hypothesised that there may be a link between muscle mass and hypertension. However, to our knowledge, this potential relationship has not been explored, particularly in the Korean population. Therefore, the present study aimed at examining the relationship between muscle mass and a hypertension diagnosis using a single blood pressure measurement of community-dwelling adults in Korea.

METHODS

Participants

Adults aged >20 years who visited the S-gu Public Health Centre in Seoul, Korea, for a medical check-up in 2011 (N=225) participated in this cross-sectional study. All of the participants provided written informed consent before participation, and the study procedures were approved by the S-gu Public Health Centre. Each participant underwent blood pressure and anthropometric measurements and provided personal information about lifestyle factors.

Measurements

Blood pressure

Participants spent 10 minutes resting in a seated position before a nurse specialist measured their blood pressure 3 times over a 2-minute interval using a mercury sphygmomanometer (Alpk, Tanake Sangyo Co., Ltd., Tokyo, Japan). The nurse specialist then calculated the average values for systolic and diastolic blood pressure from the 3 measurements (Lynn & Peter, 2012). Normal blood pressure was defined as blood pressure <140/90mmHg, and hypertension was defined as blood pressure ≥140/90mmHg according to the guidelines provided by the Joint National Committee on Prevention, Detection, Evaluation, and Treatment of High Blood Pressure VII (National High Blood Pressure Education Program, 2003).

Anthropometric measurements

Height and weight were measured after a 12-hour fasting period using a digital scale (InBody-720, Biospace, Seoul, Korea) and a stadiometer. Body mass index (BMI, kg/m^2) was calculated from these values. Muscle mass was evaluated using an 8-polar bioelectrical impedance device (InBody-720, Biospace, Seoul, Korea), which has demonstrated validity and reliability for this use (Jensky-Squires *et al*., 2008). The InBody-720 uses multiple frequencies (1, 5, 50, 250, 500, 1000kHz) to measure the resistance of the arms, legs and trunk through 8 tactile electrodes: 2 on each hand (1 each in contact with the palm and thumb) and 2 on each foot (1 each in contact with the anterior and posterior aspects). The recommendations outlined in Applied Body Composition Assessment (Heyward & Wagner, 2004), were followed for the lean body mass assessment. All of the participants were prohibited from exercising for 12 hours before the measurement. All of the participants were also required to urinate immediately prior to the impedance measurement and to wear light clothing and remove all metallic items.

Quartiles were determined from the muscle mass data, and the participants were grouped accordingly: very low muscle mass (n=56); low muscle mass (n=56); high muscle mass (n=56); and very high muscle mass (n=57). According to the central limit theorem, if the number of participants in each group is >30, the data are likely to approximate a normal distribution and be reliable (Johnson & Bhattacharyya, 2010).

Lifestyle factors

Self-reported personal information about lifestyle factors was collected for each participant

using 10 questions: gender (male or female); age; education level (up to and including elementary school, middle school, high school, or at least a college education); economic status (very poor, poor, rich, or very rich); nightly sleep duration (≤5 hours, 6 hours, 7 hours, or ≥8 hours); frequency of alcohol consumption per month (none, once, 2 to 3 times, or ≥4 times); cigarette smoking (non-smoker, ex-smoker, or current smoker); and 3 questions to determine the weekly frequency of vigorous exercise, moderate exercise and walking for exercise (none, once, twice, 3 times, 4 times, or ≥5 times).

Statistical analysis

All results are presented as mean±standard deviation or frequencies and percentages, where appropriate. Multivariate logistic regression analysis (Johnson & Bhattacharyya, 2010) was conducted to determine the relationship between muscle mass, in quartiles, and the outcome variable, hypertension, after adjustment for gender, age, BMI, education level, economic status, nightly sleep duration, alcohol consumption, cigarette smoking, and exercise. The *Hosmer-Leme show of goodness of fit test* was conducted, resulting in a value of 7.098 (p=0.526), which is an acceptable appropriateness of model for this study (Johnson & Bhattacharyya, 2010). Statistical significance was set at $p<0.05$ and all analyses were conducted using SPSS v18.0 (SPSS Inc., Chicago, IL, USA).

TABLE 1. **DEMOGRAPHIC/LIFESTYLE CHARACTERISTICS AND HYPERTENSION MEASURES: MEAN±SD OR FREQUENCY/PERCENTAGE**

Variables (n=225)			
Personal Body measures	Age (years)	53.24±10.31	
	Height (cm)	159.54±7.16	
	Weight (kg)	60.90±10.28	
	Body mass index (BMI, kg/m^2)	23.85±3.05	
Prevalence of hypertension	Hypertension BP (≥140/90 mmHg)	64	28.4%
	Normal BP <140/90 mmHg)	161	71.6%
Gender	Male	53	23.6%
	Female	172	76.4%
Education level	Elementary school	23	10.2%
	Middle school	26	11.6%
	High School	89	39.6%
	College level	87	38.6%
Economic status	Very poor	81	36.0%
	Poor	38	16.9%
	Rich	91	40.4%
	Very rich	15	6.7%
Nightly sleep duration	≤5 hours	17	7.6%
	6 hours	35	15.6%
	7 hours	33	14.7%
	≥8 hours	140	62.1%
Alcohol consumption	None	160	71.1%
	1 time per month	35	15.6%
	2-3 times per month	19	8.4%
	≥4 times per month	11	4.9%
Cigarette smoking	Non-smoker	204	90.7%
	Ex-smoker	11	4.9%
	Current smoker	10	4.4%

Vigorous physical activity	None	148	65.8%
	1 time per week	21	9.3%
	2 times per week	16	7.1%
	3 times per week	15	6.7%
	4 times per week	12	5.3%
	≥5 times per week	13	5.8%
Moderate physical activity	None	138	61.2%
	1 time per week	20	8.9%
	2 times per week	22	9.8%
	3 times per week	20	8.9%
	4 times per week	8	3.6%
	≥5 times per week	17	7.6%
Walking for exercise	None	95	42.2%
	1 time per week	15	6.7%
	2 times per week	13	5.8%
	3 times per week	27	12.0%
	4 times per week	9	4.0%
	≥5 times per week	66	29.3%

RESULTS

The demographic characteristics of the participants and the responses to the questions about lifestyle factors are provided in Table 1. Most participants (76.4%) were women, and 28.4% were diagnosed with hypertension.

The results of the multivariate logistic regression analysis are provided in Table 2. An increase in muscle mass did not significantly increase the odds of a hypertension diagnosis for any of the quartiles, compared to the very low muscle mass quartile (low muscle mass, odds ratio [OR]=0.617, 95% confidence interval [CI]=0.190–2.004, p=0.422; high muscle mass, OR=2.564, 95% CI=0.873–7.531, p=0.087; and very high muscle mass 2.975, 95% CI=0.893–9.907, p=0.076).

TABLE 2. **MULTIVARIATE LOGISTIC REGRESSION ANALYSIS: RELATIONSHIP BETWEEN MUSCLE MASS AND HYPERTENSION**

Group (n=225)	**Beta**	**Standard error**	**Odds ratio**	**95% confidence interval**	**p-Value**
Very low muscle mass	Reference		1.000		
Low muscle mass	-0.482	0.601	0.617	0.190-2.004	0.422
High muscle mass	0.941	0.550	2.564	0.873-7.531	0.087
Very high muscle mass	1.090	0.614	2.975	0.893-9.907	0.076

Note: Adjusted for body mass index (BMI), and self-reported gender, age, education level, economic status, sleep duration, alcohol consumption, cigarette smoking, and frequency of vigorous exercise, moderate exercise and walking for exercise

DISCUSSION

The results of the current study indicate that muscle mass was not associated with hypertension in this sample of Korean adults when adjusted for lifestyle factors that could also affect blood pressure.

Several conditions such as arthritis, diabetes and hypertension have been previously associated with high fat-free mass (Visser *et al*., 1998). Left ventricular mass, which is a predictor of hypertension, is also highly correlated with fat-free mass (Bella *et al*., 1998; Whalley *et al*., 1999; Kuch *et al*., 2001) and independently related to fat-free mass but not body size or composition (Whalley *et al*., 1999; Kunch *et al*., 2001). Interestingly, cardiovascular disease occurs more often in patients with left ventricular hypertrophy, compared to other patients (Koren *et al*., 1991), and left ventricular hypertrophy is an independent cardiovascular risk factor for primary and secondary hypertension, as well as coronary artery disease in the general population (Levy *et al*., 1990; Koren *et al*., 1991; Ghali *et al*., 1992; Foley *et al*., 1995).

Although the relationship between fat-free mass and left ventricular hypertrophy in addition to those between left ventricular hypertrophy and both hypertension and cardiovascular disease could imply a relationship between fat-free mass and both hypertension and

cardiovascular disease, to the best of our knowledge, there is little evidence to support the latter relationships. However, the present study failed to demonstrate a relationship between hypertension and fat-free mass. Well-designed studies are necessary to determine if there is an association between muscle mass and hypertension.

This study has certain limitations. Firstly, the use of self-reported information on lifestyle factors might have resulted in inaccurate data for the covariates in the analysis. Secondly, participants of this study were recruited from one public health centre in Seoul, Korea, limiting the generalizability to the entire Korean adult population and results are based on a small sample size drawn from one geographic area only. Thirdly, inflammation was not measured, which may have shed some light on the potential relationship with hypertension. Fourthly, the single blood pressure measurement for the clinical diagnosis of hypertension should be considered a major limitation, as guidelines recommend diagnosis based on two separate measurements. Finally, due to the retrospective and cross-sectional nature of the study, causality could not be determined.

CONCLUSION

In conclusion, muscle mass was not associated with the presence of hypertension in this sample of Korean adults, when adjusted for gender, age, BMI, education level, economic status, nightly sleep duration, alcohol consumption, cigarette smoking, and exercise frequency.

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A MOTIVATION-BASED TYPOLOGY OF TRIATHLETES

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ABSTRACT

Ironman South Africa is the only Ironman on the African continent which takes place every April in Nelson Mandela Bay (Eastern Cape Province), with nearly 2 000 athletes participating. The purpose of this research was to use reasons for participation (motivation) to identify different market segments of triathletes participating in Ironman South Africa. A survey was conducted during registration of the event in 2013 and a total of 425 questionnaires were administered. A factor analysis found that triathletes were motivated by seven motivational factors including: challenge; inner vie; health and fitness; intrinsic achievement and control; event novelty; group affiliation and socialisation; and, lastly, respect and risk. Based on these motives, three distinct clusters of triathlon participants were identified: Devotees; Enthusiasts; and Aspirationals. Although these participants have different motives, there are only significant differences in age and no other socio-demographic characteristics. This research narrowed the gap in current research related to triathlons and triathletes in the country, which is currently non-existent. The results show distinct segments of different athletes that can aid organisers and destinations to create products and services that complement the participants' motives. This can ultimately lead to a more competitive and sustainable event.

Key words: Triathlons; Market segmentation; Factor analysis; Clustering; Motivation; Sport tourism; Ironman South Africa.

INTRODUCTION

An Ironman triathlon is the longest form of triathlon and is a three-discipline event that consists of a 3.8km swim, a 180km cycle race followed by a 42.2km marathon run that triathletes need to complete in less than 17 hours (Grand'Maison, 2004). Annually, a large number of triathletes compete in 28 Ironman Triathlon races (WTC accredited), throughout the world to qualify for the Ironman world championship held in Kona, Hawaii (Ironman, 2013). Ironman South Africa is the only Ironman triathlon on the African continent and is held each year in Nelson Mandela Bay, Port Elizabeth, where it attracts approximately 2 000 triathletes and thousands of spectators (Ironman South Africa, 2013). The problem is that a limited number of studies have been done that looks specifically at the profile and motives of

these triathletes (Bell & Howe, 1988; Croft *et al*., 2007). Hawkins *et al*. (2007) emphasise that the multifaceted mind set of triathlon participants leads to a need for closer examination of triathlete motives as this is significant to better understand triathlon participants as a customer market segment. Therefore, there are a number of justifications for studying the motives of triathlon participants, which include developing and increasing adherence to

training programs, promoting similar events and increasing physical activity in general (Ogles & Masters, 2003; LaChausse, 2006; Markland & Ingledew, 2007; Brown *et al*., 2009). Better understanding of the motives of participants would also lead to more effective marketing communications, thus, enhancing the event experience and knowing on what participant's base their decisions (Crompton & McKay, 1997; Kastenholz, 2005; Casper & Stellino, 2008).

A motive, according to Hawkins *et al*. (2007:130) is the "unobserved inner force that stimulates, compels and directs a certain behaviour response". Iso-Ahola (1982:230) defines a motive as: "an internal factor that arouse, directs and integrates a person's behaviour". Hudson (1999:7) states that "the concept of needs is central to most theories of motivation". Park *et al*. (2008) affirm that a person's desire to meet needs triggers a decision to engage in certain tourism behaviour that will meet these needs. When it comes to sport, there is a set of motivational factors established in anticipation of the fulfilment of the desired needs (Cassidy & Pegg, 2008). A distinction commonly made in sport is between intrinsic and extrinsic motives (Kruger & Saayman, 2013). Motives purely driven by the enjoyment of the task, for example for fun, for experiencing competence, achievement or self-determination, are referred to as intrinsic motives (Ryan & Deci, 2007). Extrinsic motives explain behaviour where external awards or contingencies are present, for example tangible benefits like trophies or social rewards like prestige (Vallerand & Losier, 1999; Deci & Ryan, 2000). These theories laid the foundation for other advanced motivation theories, particularly the self-determination theory (Deci & Ryan, 1985). The self-determination theory suggests that people are pushed to achieve goals through intrinsic and extrinsic pressure, and that self-determined (intrinsically motivated) behaviours will generally lead to more positive experiences (Vallerand & Losier, 1999).

Research on the motive for participation will not only benefit the event, but will also help participants adapt their training programmes, promote other triathlon events and increase physical activity by inspiring the general public and especially the youth (Ogles & Masters, 2003; Filo *et al*., 2009). This type of study can also be beneficial for the shareholders that operate within the triathlon industry (Tribe Group, 2009). Firstly, it will help to deepen the understanding of the triathlete as a customer, because when the event organisers focus their attention on the triathletes' needs, they will be able to increase the demand for their triathlon products/services (Hawkins *et al*., 2007). In addition, companies that manufacture triathlete equipment can increase their efficiency by incorporating the motives of participants into their advertising and promotional activities (Lovett, 2011). Streicher and Saayman (2010) remarked that research done in endurance sport, such as Ironman South Africa, will also help South African event organisers to secure more participants in the event; increase media coverage; boost the number of spectators watching the event live or via print and electronic media; gain more corporate sponsorships; ensure government support; create more jobs for private vendors at the event; and encourage an active lifestyle.

Currently, sport research consists of a few studies that examined triathletes from the

perspective of what motivates them to compete (Case & Branch, 2001; Grand'Maison, 2004; Tribe Group, 2009; Smith, 2010; Lovett, 2011; Lamont & Kennelly, 2012; Wicker *et al*., 2012). Case and Branch (2001:118-127) conducted a study on participants in an off-road triathlon and found that "to test one's skills against nature, others and myself" was the main

motive to participate for these triathletes. Grand'Maison (2004) identified the following motives for triathletes: push limits; improve physical fitness; mental conditions; challenge; goals and improvement; and sense of accomplishment. Tribe Group (2009) conducted an intensive study on triathletes and found personal challenge, a way to get or stay in shape, improve on previous results and to inspire others as their motives to participate. In a study conducted on elite female triathletes, Smith (2010) found challenge, love of the sport and togetherness as the main motives, while Lovett (2011) found that triathletes participating in sprint distance triathlons were motivated by affiliation, life meaning, personal goals, achievement, competition and self-esteem. Wicker *et al*. (2012) revealed socialisation, competition, well-being and love of the sport as the main motives of triathlon participants.

It is evident from the afore-mentioned results that each triathlon participant is motivated for different reasons and although there are corresponding motives within the sport, each event has a unique blend of participants. The results also show that there are variations of motives within the different distances of triathlons (sprint, Olympic, half-ironman and ironman). Distinctions can also be made between gender and level of competition (amateur vs. elite). Collectively, the results (Grand'Maison, 2004; Smith, 2010; Lovett, 2011; Lamont & Kennelly, 2012; Wicker *et al*., 2012) show that: (1) there are differences between male and female motives for participation of triathletes; (2) there are distinctions in different age categories; (3) differences in level of experience; (4) motives for participation have a tendency to shift the longer the athlete has been participating (Smith, 2010); and (5) socio-demographic variables of triathlon participants could be considered as the foundation to segment the motives of participants (Wicker *et al*., 2012).

Participant segmentation has been researched in triathlons in a few previous studies. In a market research study conducted in the USA, triathletes were segmented based on their attitudes towards triathlons, resulting in seven clusters, namely: *Enthusiastics* (triathletes who enjoy everything about a triathlon and who get personal benefit from participating more than any other segment); *Dedicated triathletes* (they garner immense value for their participation and see it as the core to their lifestyle, they compete because that is what they do); *Aspirationals* (they are focused on their own races and personal performance and improving past performances, their focus is mostly on accomplishment of finishing a triathlon); *Competitives* (these triathletes are concerned with their standings in the race and they want to finish ahead of others); *Power Trainers* (they are not focused on their past history, are inspired by others and see training as just as important as racing); *Emotionals* (they appreciate being part of the triathlon community and value the social aspects of participating in a triathlon, but triathlons are not the central part of their lives); and *Dabblers* (they are committed to the personal challenge of triathlons and their ability to keep them or get them into shape, their engagement in the sport is not all encompassing). Each of these clusters has specific characteristics and motives for participating in a triathlon (Tribe Group, 2009:14-16). Triathletes, therefore, seem more or less homogeneous demographically; however, they are not a monolithic group as their motives to participate (as seen from the seven clusters) are broad and vary from one another.

In Japan, triathlon participants were clustered based on their motives (intrinsic motivations like understanding and growth, accomplishment, stimulation and experience, victory and extrinsic motives, such as exogenous control and assimilation, tourism and Aesthetics), to

participate (Harada *et al*., 2010). The four clusters included the *maniacal triathletes, triathletes with hidden potential, experienced triathletes* and lastly *triathletes with unclear motivation*. In a study done in Australia, Chang and Johnson (1995), moved away from using motives to segment triathletes and segmented triathlon association members based on financial aspects and specifics of the membership. The researchers identified four segments including the *mainstream members, frequent racers, true believers* and *value seekers*. The unique finding in this study was the fact that the value seekers were seen as the most price sensitive segment. Wicker *et al*. (2012) conducted a study based on lifestyle segmentation to segment 786 triathletes in Germany, who were labelled *serious pursuiters, sport lovers* and *socialisers* depending on their interests and the activities they form part of in their leisure time. Significant differences revealed that there were differences between these clusters in terms of age, gender, years of participation, time of practise, as well as expenditure. These different clusters show that triathletes can form different market segments based on different variables. Therefore, triathletes cannot be seen as a homogenous market.

RESEARCH PROBLEM

To date, no research has focused on identifying the profile and motives of triathletes competing in a South African triathlon event. Previous research in the country has mainly focused on other types of endurance events including cycling (Streicher & Saayman, 2010), marathons (Kruger *et al*., 2012; Kruger & Saayman, 2013), and swimming (Kruger *et al*., 2011). The following observations can be made from previous research in endurance sport events, specifically in a South African context: (1) Sport participants travel to destinations to compete in different sport events for different reasons; (2) The reasons are mostly influenced by the type of event, distance, level of fitness required, duration and terrain where the event is held (Kruger & Saayman, 2013); and (3) Sport participants are not a homogenous group when taking their profiles and motives to participate into account.

The goal of this research was to segment triathletes competing in Ironman South Africa, based on their motives for participation, to identify and profile different markets/segments at the race. This study will, therefore, add to the body of existing literature on sport motivation of the endurance athlete, specifically that of South African triathletes, that has not previously been researched.

METHODOLOGY

This was a quantitative research study where a structured questionnaire was used to collect the data. The following section describes the sampling method and survey, the questionnaire, as well as the statistical analysis conducted.

Sampling method and survey

A destination-based survey was undertaken where questionnaires were handed out on-site at the Boardwalk Convention Centre and Spa during the registration period of Ironman South Africa (11 to 13 April 2013). Ethical approval was obtained from the Ethics Committee of the

North-West University (Potchefstroom Campus: NWU-00115-12-A4). The main purpose of research ethics is to protect the welfare of the research participants (Wassenaar, 2006).

Therefore, ethical considerations were taken into account by respecting the rights, needs values and desires of the participants (Creswell, 1994). Consent was obtained from the organisers, as well as from all participants, before the survey was administered. Seven fieldworkers were instructed on how to approach participants and on the aim of the study and questionnaire. The fieldworkers were grouped in pairs and each group had to work a 2-hour shift each of the 3 days where they had to hand out as many questionnaires as possible. The fieldworkers were instructed to approach different types of participants including different genders, age-categories and nationalities to ensure a representative sample.

Participants were approached after they had completed their registration and informed about the purpose of the research to ensure that they participated willingly and responded honestly. The population size was approximately 1 744 triathletes when looking at 2012 participation records (Ironman South Africa, 2013). If this number of triathletes is used to calculate the sample size, the appropriate sample size is calculated at 313 respondents. However, when one takes into account the importance of accuracy and completeness, the sample size was increased to 450 questionnaires. Fieldworkers collected a total of 425 completed questionnaires and thus the number of questionnaires encompasses more than the 313 questionnaires calculated by using the Krejcie and Morgan (1970) sample size formula.

Questionnaire

The questionnaire was based on the work of McCarville (2007), Smith (2010), Streicher and Saayman (2010), Kruger *et al*. (2011), Lovett (2011), Lamont and Kennelly (2012), and Wicker *et al*. (2012). The questionnaire was divided into 2 sections: Section A, demographic information of triathletes; and Section B, motivational factors that contribute to participation. Section A captured demographic details (gender, home language, age, gross annual income, home province, country of origin, level of education, marital status, mode of transport), and spending behaviour (number of people in travelling group, number of participants/spectators paid for and expenditure). Section B captured motivational factors, measuring 24 items on a 5-point Likert scale (from 1 = not at all important to 5 = extremely important). Section B also captured information specific to the behaviour of participants during and before the event (entry details, previous participation in Ironman South Africa or internationally, number of sport events per year, primary category, age exposed, person who exposed you to the sport, other sporting events previously competed in, upcoming sport events in 2013, initiator of participation and sources of information about the event).

Statistical analysis

The data was captured using Microsoft Excel and analysed using SPSS (SPSS Inc, 2013). The analysis was done in 4 different stages: a factor analysis; a cluster analysis; an analysis of the significant differences; and effect sizes between motivational clusters of participants at Ironman South Africa.

Firstly, a principal axis factor analysis, using an Oblimin rotation with Kaiser Normalisation, was performed on the 24 motivation items, to explain the variance-covariance structure of a set of variables through a few linear combinations of these variables. The Kaiser-Meyer-Olkin measure of sampling adequacy was used to determine whether the covariance matrix

was suitable for factor analysis. Kaiser's criteria for the extraction of all factors with eigenvalues larger than unity were used because they were considered to explain a significant amount of variation in the data. All items with a factor loading greater than 0.3 were considered as contributing to a factor, and all items with loadings less than 0.3 as not correlating significantly with a factor (Steyn, 2000). Any item that cross-loaded on 2 factors, with factor loadings greater than 0.3, was categorised in the factor where interpretability was best. A reliability coefficient (Cronbach's alpha) was computed for each factor to estimate its internal consistency. All factors with a reliability coefficient above 0.6 were considered as acceptable in this study. The average inter-item correlations were also computed as another measure of reliability. These, according to Clark and Watson (1995), should lie between 0.15 and 0.55.

Secondly, a cluster analysis, using Ward's method with Euclidean distances, was performed on the scores of the motives for participating in Ironman South Africa. A cluster analysis is a multivariate interdependence technique, where the primary objective is to classify objects into relatively homogeneous groups based on the set of variables considered, and it is mostly an exploratory technique (Hair *et al.*, 2000). Hierarchical clustering makes no assumptions concerning the number of groups or group structure. Instead, the members are grouped together based on their natural similarity (Johnson & Wichern, 2007). This research did not take an *a priori* view of which data points should fall into which segment. Rather, a hierarchical cluster analysis was used to explore the natural structure of the data, by means of Ward's method with Euclidean distances.

Thirdly, ANOVA's, 2-way frequency tables and chi-square tests were used to investigate any significant differences ($p \leq 0.05$) between the participant clusters. The study used demographic variables (gender, home language, country of origin, age and province of origin), and behavioural variables (length of stay, transport, times participated, expenditure, other events participating in, initiator of participations, and when were the participants exposed to triathlons), to examine whether there were statistically significant differences between the groups. Lastly, effect sizes were used to further identify any significant differences between the clusters. The purpose of effect size is to establish whether any differences exist between clusters, in this case in which combination of clusters the averages of the socio-demographic and behavioural variables had the smallest or largest effect. Cohen (1988), as well as Ellis and Steyn (2003), offer the following guidelines for the interpretation of the effect sizes: small effect $d = 0.2$; medium effect $d = 0.5$; and large effect: $d = 0.8$.

RESULTS

This section will discuss the results of the factor analysis (motives to compete), results of the cluster analysis and the ANOVAs and effect sizes.

Factor analysis

The pattern matrix of the principal axis factor analyses using an Oblimin rotation with Kaiser Normalisation identified 7 factors (motives) for participation (Table 1). These factors accounted for respectively 67% of the total variance.

TABLE 1. **FACTOR ANALYSIS: MOTIVES FOR COMPETING IN IRONMAN SOUTH AFRICA**

Motivational factors and items	Factor loading	Mean value	Reliability coefficient	Average inter-item correlation
Factor 1: ***Event novelty***		3.57	0.75	0.38
I do it annually	0.60			
It is an international event	0.56			
Because the event is well organised	0.53			
Ironman tests my level of fitness and endurance	0.37			
For the adventure of it	0.32			
Factor 2: ***Respect and risk***		2.71	0.75	0.43
To earn respect from peers	0.61			
Because of the risk involved	0.62			
To make friends & family proud of me	0.54			
To escape	0.42			
Factor 3: ***Inner vie*** (compete, contend)		3.80	0.71	0.39
To push myself	0.75			
To improve my time and speed	0.62			
To compete with myself	0.54			
To compete with others	0.42			
Factor 4: ***Intrinsic achievement & control***		3.63	0.76	0.52
To feel proud of myself and have a sense of achievement	0.65			
To improve my self-esteem	0.60			
To mentally control my body	0.54			
Factor 5: ***Group affiliation and socialisation***		3.02	0.84	0.72
To share group identity with other triathletes	0.80			
To socialise with others	0.76			
Factor 6: ***Health and fitness***		3.77	0.89	0.80
To improve my health	0.87			
To improve my level of fitness	0.84			
Factor 7: ***Challenge***		4.10	0.68	0.35
Competing in Ironman is a personal challenge	0.63			
To test my skills against nature, others and myself	0.50			
It is a major challenge	0.46			
Because it is stimulating and exciting	0.32			

All the factors had high reliability coefficients, ranging from 0.68 (the lowest) to 0.89 (the highest), while the average inter-item correlation coefficients with values between 0.35 and

0.80 also implied internal consistency for all factors. Moreover, all items loaded on a factor with a loading greater than 0.3 and the relatively high factor loadings indicated a reasonably high correlation between the factors and their component items. The Kaiser-Meyer-Olkin measures of sampling adequacy of 0.87 also indicated that patterns of correlation were relatively compact and yield distinct and reliable factors (Field, 2005). Bartlett's test of sphericity also reached statistical significance ($p<0.001$) supporting the factorability of the correlation matrix (Pallant, 2007).

Factor scores were calculated as the average of all items contributing to a specific factor in order to interpret them on the original 5-point Likert scale of measurement. As Table 1 shows, the following motives for Ironman participants were identified: *event novelty* (Factor 1); *respect and risk* (Factor 2); *inner vie* (Factor 3); *intrinsic achievement and control* (Factor 4); *group affiliation and socialisation* (Factor 5); *health and fitness* (Factor 6); and *challenge* (Factor 7). *Challenge* obtained the highest mean value (4.10) and is seen as the most important motive for participating in the triathlon, with a reliability coefficient of 0.68 and an average inter-item correlation of 0.35. *Competition* had the second highest mean value (3.80), followed by *health and fitness* (3.77), *intrinsic achievement and control* (3.63), *event novelty* (3.57) and *group affiliation and socialisation* (3.02). *Respect and risk* had the lowest mean value (2.71) and is rated as the least important motive for participating in Ironman South Africa.

Cluster analysis

An exploratory cluster analysis based on all cases in the data was performed on the motivational factors.

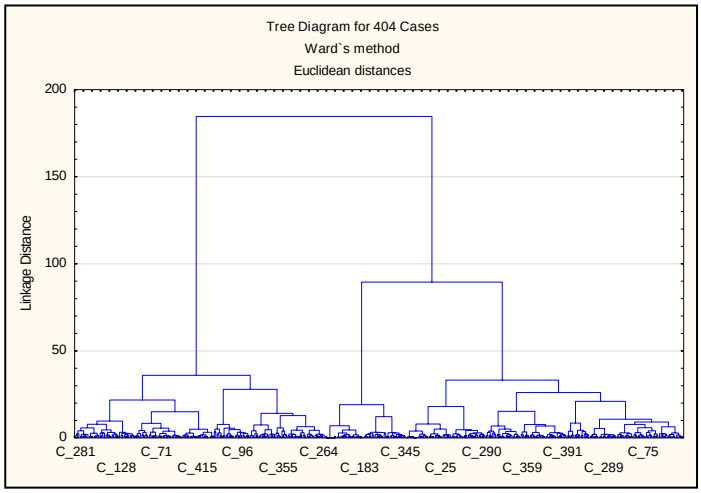

FIGURE 1. **THREE CLUSTER SOLUTION: WARD'S METHOD WITH SQUARED EUCLIDEAN DISTANCE MEASURES**

A hierarchical cluster analysis, using Ward's method of Euclidean distances, was used to determine the structures of the clusters on the basis of the motivation factors. A 3-cluster solution was selected as the most discriminatory (Figure 1). The results of the multivariate

analyses were used to identify the 3 clusters and to discover whether significant differences existed between them ($p<0.05$).

Identification of segmented clusters

As shown in Table 2, ANOVAs indicate that all 7 motivational factors contributed to differentiating the 3 motivational clusters ($p<0.05$). Corresponding with the results of the factor analysis, *Challenge*, was regarded as the most important motive to participate in Ironman South Africa for all 3 clusters.

TABLE 2. **COMPARISONS BETWEEN MOTIVATIONAL FACTORS IN THREE CLUSTERS OF IRONMAN SOUTH AFRICA PARTICIPANTS**

Motives to compete	Devotees (n=155)	Enthusiasts (n=54)	Aspirationals (n=195)	F-Ratio	Significance Level
Event novelty	3.89[a]	4.64[b]	2.99[c]	158.049	<0.05
Respect and risk	2.84[a]	4.26[b]	2.18[c]	175.177	<0.05
Inner vie	4.00[a]	4.58[b]	3.42[c]	75.571	<0.05
Intrinsic achievement and control	4.00[a]	4.79[b]	2.98[c]	197.943	<0.05
Group affiliation and socialisation	3.19[a]	4.24[b]	2.54[c]	74.607	<0.05
Health and fitness	4.14[a]	4.66[b]	3.23[c]	97.584	<0.05
Challenge	4.25[a]	4.83[b]	3.76[c]	81.101	<0.05

* Statistically significant difference: $p\leq0.05$
[a] Group differs significantly from type (in row) where [b] and [c] are indicated.
Statistics: ANOVA and Tukey's Post Hoc Multiple Comparisons

Cluster 1 included the second largest number of respondents (n=155), as well as the second largest mean values across all 7 motivational factors. This cluster rated the following motives as important: *intrinsic achievement and control*; and *health and fitness*. These triathletes thus participate mostly for personal benefit. When looking at their socio-demographic characteristics (Table 3), it is clear that they enjoy every part of an Ironman triathlon as these triathletes spend the most money on the sport and participate in the most Ironman South Africa and international Ironman competitions. These characteristics show that this cluster is devoted to the Ironman event and, therefore, was labelled the *Devotees*.

TABLE 3. **ANOVA RESULTS: DIFFERENCES BETWEEN MOTIVATIONAL CLUSTERS**

Characteristics	Devotees (n=155)	Enthusiasts (n=54)	Aspirationals (n=195)	F-Ratio	Sign. level

Age	38.25[a]	36.96[a]	40.45[b]	4.716	0.090*
Group size	2.98	2.89	2.52	2.028	0.133
Number of people paid for (participants)	1.31	1.35	1.16	1.779	0.170
Number of people paid for (spectators)	1.70	1.63	1.52	0.427	0.653
Nights in area	4.85	5.30	5.52	2.973	0.950
Total spending	R22463.23	R18600.19	R23004.40	0.184	0.832
Spending per person (paid for participants) [#]	R19595.69	R13266.04	R18450.07	1.456	0.234
Spending per person (paid for spectators)	R17315.57	R12951.55	R14591.29	0.674	0.511
Times participated	2.06	1.93	1.75	0.716	0.490
Times finished	1.86	1.65	1.48	1.036	0.356
Times internationally finished	1.49	1.24	1.36	0.741	0.478
Triathlon events per year	4.43	6.22	4.72	0.936	0.393
Cycling events per year	3.68	3.81	2.95	1.228	0.294
Running events per year	6.04	6.69	5.74	0.253	0.777
Swimming events per year	1.16	1.56	0.99	1.644	0.195
Age first exposed to triathlons	30.68	28.16	31.29	2.149	0.118

* Significant difference: $p \leq 0.05$

[a] Group differs significantly from type (in row) where [b] is indicated.

Cluster 2 covered the smallest number of respondents (N=54) and had the highest mean values across all 7 motivational factors. This cluster regards *challenge, intrinsic achievement and control, health and fitness* and also *event novelty* as the most important motives (Table 2). This shows that these triathletes are motivated by an array of motives seeing that they have the need to improve themselves to become better triathletes. Their demographic characteristics also correspond with their motives when considering the fact that they are the youngest, were exposed to triathlons at a young age and compete in the most individual endurance sport events including swimming, running and cycling to improve their triathlon

skills across all 3 sport disciplines (Table 3). Therefore, this cluster was labelled the *Enthusiasts.*

Cluster 3 contained the largest sample of respondents (N=195) and had the lowest mean scores across the 7 motivation factors. The cluster saw *Inner vie* and *health and fitness* as the most important motives for participation (Table 2). These triathletes participate to feel a sense of personal accomplishment, to be part of the Ironman event and just to say: "I have finished another Ironman event". Their demographic characteristics show that they are the oldest participants, spend more nights in the event destination, have the highest total spending and

compete in the least number of Ironman events (Table 3). This cluster compete with themselves and care about their personal performance, consequently they were categorised the *Aspirationals.*

Multiple comparisons and effect sizes

TABLE 4. **DIFFERENCES BETWEEN MOTIVATIONAL CLUSTERS**

Characteristics	Cluster 1 and 2	Cluster 1 and 3	Cluster 2 and 3
Age	0.15	0.25**	0.39**
Group size	0.04	0.19	0.15
Number of people paid for (participants)	0.04	0.15	0.23**
Number of people paid for (spectators)	0.05	0.12	0.07
Nights in area	0.17	0.24	0.08
Total spending	0.15	0.01	0.07
Spending per person (paid for participants)	0.25**	0.05	0.22**
Spending per person (paid for spectators)	0.17	0.11	0.10
Times participated	0.06	0.13	0.08
Times finished	0.10	0.17	0.08
Times internationally finished	0.08	0.11	0.17
Triathlon events per year	0.13	0.05	0.11
Cycling events per year	0.02	0.14	0.22
Running events per year	0.10	0.04	0.12
Swimming events per year	0.19	0.09	0.26
Age first exposed to triathlons	0.26**	0.06	0.33**

Effect sizes: (a) Small effect: ***d*=0.2; (b) Medium effect: ****d*=0.5 (c) Large effect: ***

As Table 4 shows, there were significant differences between the 3 clusters of Ironman participants based on age (p=0.09). The *Aspirationals* were the oldest (40.45 years), whereas the *Enthusiasts* were the youngest of the 3 clusters (36.96 years). When looking at the effect sizes, there were only small differences between the clusters based on age, number of participants paid for, average spending and age first exposed to triathlons. The *Aspirationals* paid for the fewest number of participants (average 1.16 people), while the *Enthusiasts* paid for the most participants (average of 1.35 people).

When looking at average spending, the *Aspirationals* had the highest average total spending (an average of R23 004); however, all 3 clusters had a high average spending during the event: *Devotees* had an average of R22 463 and the *Enthusiasts* an average of R18 000. The *Enthusiasts* were exposed to triathlons at a younger stage (an average of 28.16years) than the other 2 clusters and thus have been participating in triathlons for longer. Although there are no statistical differences based on other characteristics it is important to note that the *Enthusiasts* participated in more triathlon events (on average 6.22 events), cycling events (on average 3.81 events), running events (on average 6.69 events) and swimming events (on average 1.56) per year, than the other 2 clusters (Table 4).

When considering the group size, it is clear that *Devotees* travel in larger groups (an average of 2.89 people), and they also pay for more spectators (on average 1.70 people) during the event. On average, all 3 clusters stay at least 5 nights in the event area, although the *Aspirationals* stayed the longest in the event area (an average of 5.52 nights). The *Devotees* had the highest average spending for participants (R19 595 per person), and spectators (R17 315 per person), while *Enthusiasts* spent the least money paying for spectators and participants. When observing the frequency of participation both in South Africa and internationally, it is clear that *Devotees* have participated in the most Ironman South Africa triathlons (an average of 2.06), the most international Ironman races (an average of 1.49), and have finished the most Ironman South Africa triathlons (an average of 1.86).

DISCUSSION

Firstly, it is imperative to note that, although previous studies show similar motives, the combination and importance of each motive found in this study is unique and differs from other literature. The results from this study showed that participants in Ironman South Africa were motivated by seven motives: *challenge, inner vie, health and fitness, intrinsic achievement and control, event novelty, group affiliation and socialisation*, as well as *respect and risk*. *Challenge* and *inner vie* were the most important motives for competing in the event. When these findings are compared with previous research, the following parallels can be made, especially in terms of *challenge* found in studies done by Grand'Maison (2004), Tribe Group (2009) and Smith (2010). The motive, *Intrinsic achievement and control,* corresponds with the findings by Grand'Maison (2004) and Lovett (2011). Only Smith (2010) found *respect and risk* as motives to participate in a triathlon. *Socialisation* was found by Lamont and Kennelly (2012) and Wicker *et al*. (2012), although the combination of *group affiliation and socialisation* was not found in any previous studies. *Inner vie* was found in almost all of the previous studies including Case and Branch (2001), Grand'Maison (2004), Tribe Group (2009), Lovett (2011) and Lamont and Kennelly (2012). These motives confirm the notion that triathlon participants are not motivated by 1 single motive, but rather a combination of different motives (Grand'Maison, 2004; Shilbury *et al.*, 2009; Lovett, 2011).

Secondly, *health and fitness* as a motive is not only unique to this study but is also the first time that *health and fitness* was found as a motive for participation in endurance sport literature (Streicher & Saayman, 2010; Kruger *et al*., 2011; Kruger & Saayman, 2013). Previous research (Grand'Maison, 2004; Lamont & Kennelly, 2012; Wicker *et al*., 2012), only focused on one or the other. *Event novelty* (extrinsic motive) was also found for the first time as a unique motive for participation in a triathlon. These findings support the notion that

the motives of endurance sport participants are influenced by the type of sport and event (Kruger & Saayman, 2013).

Thirdly, the study found that *challenge* was the main motive for participation in Ironman South Africa and, as a result, Ironman triathletes are motivated more by intrinsic motives than extrinsic motives. This corresponds with research done by Ryan and Deci (2007), who observed a general trend that endurance sport participants are more intrinsically than extrinsically motivated. This shows that the driving force behind the participation of most triathletes is the challenge against oneself, others and nature. Thus, triathletes feel the urge to push their bodies and minds to extremes. This finding is also consistent with the self-determination theory which suggests that people are pushed to achieve goals through intrinsic pressures which leads to more positive experiences (Vallerand & Lossier, 1999). Hosch

(1994), Ogles and Masters (2003) and Tribe Group (2009) also support this finding and state that triathletes are a unique kind of participant as they get personal satisfaction when they challenge themselves both physically and mentally and will adapt their lifestyle in order to be a triathlete.

Fourthly, the Ironman South Africa market was divided into 3 different distinct segments using a cluster analysis based on the identified motives: *Devotee*; *Enthusiasts*; and *Aspirationals.* Confirming the results of the factor analysis, all 3 clusters regarded *challenge* and *inner vie* as the most important motives to participate in the event. Most differences can be found at a behavioural level rather than socio-demographics. There are clear parallels with the research done by the Tribe Group (2009) and Harada *et al*. (2010). Not only does each of the segments share similar characteristics, but also the motives to compete in a triathlon are similar. It was, however, difficult to compare clusters with previous studies, such as Chang and Johnson (1995) and Wicker *et al*. (2012), as these studies used financial variables and lifestyle variables to segment the triathletes. Each cluster has specific motives that push them to participate in a triathlon or return to participate in an Ironman event. If one does an analysis based on the age of the competitors, it becomes clear that these competitors are much older than one would find in individual sport, like swimming, running and cycling (Streicher & Saayman, 2010; Kruger *et al*., 2011; Saayman & Saayman, 2011; Kruger *et al*., 2012; Kruger & Saayman, 2013). This is an important finding since it implies that a swimmer, cyclist or runner could easily extend their competitive age if they want to do so by competing in Ironman competitions.

PRACTICAL IMPLICATIONS

Based on these findings, this research envisages the following marketing implications:

(1) It is crucial that marketers target each of the three clusters separately, as each cluster is a viable and sustainable market, but this can only be done by focusing on the specific needs and motives of each market.

(2) The *Devotees* are loyal to the Ironman event and have participated in most of the Ironman South Africa and International races. Consequently, marketers must emphasise how unique the Ironman competition is and that only a small number of people can say they have finished the competition. Marketers and event managers can also assist the *Devotees* by putting together loyalty programs where these participants get discount and special prices if they compete in a certain number of Ironman races. Organisers can also consider introducing special numbers or colours for participants to wear that distinguish them from others in the field. Marketing messages need to be distributed at other Ironman events as well as manufacturers, retail shops and nutrition stores seeing that these triathletes spend the most money on equipment and other triathlon necessities.

(3) Implications for the *Enthusiasts* segment include developing strategies in targeting these participants considering that they are the up-coming triathletes and can become devotees if their needs are met correctly. Marketers must develop messages that highlight the different benefits of participating in an Ironman event not only the intrinsic benefits, but also the extrinsic benefits, for example, highlighting the fact that the event is well organised and that it is one of the Ironman events that can help them qualify for the Ironman world championships. These marketing messages should mostly be distributed

at other endurance sport events that can help these athletes train for the Ironman event.

(4) Marketers must reach the *Aspirationals*, seeing that the majority of triathletes that participated in Ironman South Africa fell in this cluster. This can be done by making it worthwhile to return each year, thus, changing and improving the event each year. Marketing messages should highlight the fact that age cannot keep a true triathlete down and that the personal accomplishment will justify their participation. These messages can be distributed at clubs and gymnasiums.

(5) Knowing that triathletes seek a *challenge*, marketers must adapt their marketing messages by notifying potential participants that Ironman South Africa is the ultimate endurance event on the African continent. The event will challenge them physically and mentally and, at the end of the event, participants will feel that they have overcome a major challenge and feel a sense of self-worth and personal gratification. Marketers should also highlight that Ironman is the toughest, longest and one of the biggest personal challenges a person can face and also has added benefits of improving one's self-esteem, as well as health and fitness. These marketing messages can be distributed at other endurance events especially swimming, running and cycling events, but also other Ironman triathlons around the world. Marketers can also market Ironman at other triathlon events including half-Ironman, sprint distance and Olympic distance triathlon events. These marketing efforts will attract all three clusters, as well as new participants to the event.

(6) Since competing in a triathlon is expensive, travel packages that include accommodation, transport and catering could be considered to help make these events more affordable for the general public, thus giving more people the chance to participate.

(7) Results revealed that participant' motives to compete and sport behaviour are influenced by early exposure to triathlons (exposure at a young age greatly influence participation in later life, such as the *Enthusiasts)*. Participation in sport should be encouraged from a young age to ensure the growth and love for sport and triathlons. IronKids (an Ironman event especially for children), should be promoted more intensively at schools around the country.

CONCLUSIONS

This study determined the motives of triathletes participating in Ironman South Africa (the ultimate endurance sport on the African continent), and clustered the participants according to these motives. This type of research was conducted for the first time at a triathlete event in South Africa and the profile and motives of these participants have been identified. These motives are unique to this study in comparison with previous research and were used to make certain recommendations to event organisers. With these results, gaps in the existing literature have been filled, since this research contributes to the literature not only of sport events but also of triathlete participants in South Africa.

The study corroborates the argument that motives for participating differ according to the sporting event, and supports the view that marketers and sports event organisers must understand that participants have different motives which lead to different needs and therefore should not be regarded as a homogeneous group. In fact, this study shows not only that motives for participating in triathlons differ from those for participating in other types of endurance events, but also that the combination of motives differs. This study also

highlighted the fact that the competitors are much older than competitors in individual sporting events, for example swimming, cycling or running.

This type of research is valuable to sport event organisers, as it assists in making informed and cost-effective marketing and product development decisions. It is, thus, recommended that similar research (comparing the motives of participants and whether they are primarily intrinsic, extrinsic or a combination), be undertaken for other endurance events and other South African sporting events. Looking particularly at the economic value of this event, it is important that research continues at Ironman South Africa and other similar events, so as to sustain these types of endurance events.

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INFLUENCE OF MOTIVATIONAL PROCESSES ON ENJOYMENT, BOREDOM AND INTENTION TO PERSIST IN YOUNG SPORTSPERSONS

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ABSTRACT

The aim of the study was to examine the influence of motivational processes on enjoyment, boredom and intention to persist in the sport context. A total of 985 sportspersons ranging in age from 10 to 16 years (14.34±2.52), and from 24 different sport modalities participated in the research. A structural equation model was constructed using the robust maximum likelihood estimation. The model showed that the perception of 'support and satisfaction' of the basic psychological needs for competence predicted autonomous motivation. Both of these variables also emerged

as positive predictors of 'enjoyment' and 'intention to persist'. Moreover, a greater satisfaction of the basic psychological needs for relatedness negatively predicted 'amotivation' and, therefore, 'boredom'. Thus, social factors related to the coach and 'self-determined motivation' emerged as positive predictors of 'enjoyment' and the 'intention to persist' in the sport.

Key words: Youth sport; Self-determination; Basic psychological needs; Persistence.

INTRODUCTION

Physical activity and sport practise have been shown to have a positive impact on the development of children and adolescents, both physically (Liese *et al*., 2012) and holistically, benefiting cognitive and social systems (Sousa *et al*., 2006). Thus, socialisation through sport and physical activity introduces the youth to an environment in which significant individuals (parents, coaches and peers) become powerful role models and their physical activity is increased and optimised through participation and involvement in sport. This study aimed to examine the importance of social factors (coaches) on the motivational processes of young sportspersons, assessing the ability of these variables to explain and predict adaptive consequences, such as enjoyment, boredom and intention to persist.

Motivational processes are best understood within a theoretical framework. The Self-Determination Theory (SDT) (Deci & Ryan, 1985; Ryan & Deci, 2000), is a macro-theory of motivation, that has been used to understand motivation within the context of physical activity. SDT theorists propose that motivation lies on a continuum, and they distinguish three types of behavioural regulation that are associated with varying degrees of self-

determined motivation: autonomous motivation; controlled motivation; and amotivation (Ryan & Deci, 2000).

Autonomous motivation is the highest degree of self-determined motivation and is governed by three types of regulation: intrinsic regulation (engaging in activities for the feelings of enjoyment, pleasure, interest and satisfaction that result); integrated regulation (occurring when regulations are fully assimilated with self so they are included in the person's self-evaluation and beliefs on personal needs) (Vallerand & Rosseau, 2001); and identified regulation, which is believed to be an autonomous form of external motivation (understanding and valuing an activity and the outcomes associated with the activity). In contrast, SDT posits that *controlled motivation* comprises two behavioural regulations: introjected regulation (engagement in an activity to avoid feelings of guilt and shame or to achieve feelings related to personal ego, such as pride); and external regulation (behaviours controlled by contingencies external to the individual, such as rewards, punishments, or external expectations). Finally, *amotivation* represents the absence of motivation, either intrinsic or extrinsic (engaging in an activity without intention or volition).

Central to SDT is the concept that self-determined motivation is driven by the desire to satisfy three Basic Psychological Needs (BPN), namely autonomy, competence and relatedness. *Autonomy satisfaction* is the need to experience volition and free will, or the sense that an individual has personal control of his or her own life. *Competence satisfaction* refers to the need to effectively carry out a behaviour to achieve a desired outcome and the

ability to manage situational demand. Finally, *relatedness satisfaction* refers to the need to interact with and feel connected to and accepted by others (Deci & Ryan, 2000).

The Hierarchical Model of Motivation (Vallerand, 2001) explains the motivational process in a variety of contexts (sport, physical education, workplace), and at different levels (global, contextual and situational). It explains how social contextual variables can influence the BPN of sportspersons with regard to satisfaction and consequently their motivation quality. Furthermore, this model indicates that greater levels of self-determination promote more positive/adaptive outcomes (Torregrosa *et al*., 2008; Álvarez *et al*., 2009; Riley & Smith, 2011), whereas lower levels of self-determination are associated with negative/maladaptive outcomes (Isoard-Gautheur *et al*., 2012; Ramis *et al*., 2013).

Many studies have assessed the importance of significant relationships in the motivational processes of sportspersons; however, most of these studies have focused on analysing the influence of the coaches. Notably, Balaguer *et al*. (2008) showed that the perceived level of autonomy support from coaches predicted a greater satisfaction with the need for autonomy and relatedness, self-determined motivation and higher self-esteem and life satisfaction. Similarly, Ramis *et al*. (2013) demonstrated that the role of the coach was more important in the perception of autonomy support among sportspersons than the role of peers and parents. Moreover, the researchers concluded that autonomy support was the antecedent of intrinsic motivation. Another important study was conducted by Álvarez *et al*. (2009), who showed that the perception of autonomy support from coaches predicted satisfaction of BPN, intrinsic motivation, enjoyment and boredom.

Furthermore, several studies (Almagro *et al*., 2011; Jõessar *et al*., 2011; García-Calvo *et al*., 2012) have treated intention to continue practising a sport as a dependent variable. These studies demonstrated the relevance of direct agents, such as coaches, on the motivational processes of sportspersons and their intention to continue participating in the sport to the satisfaction of the BPN of sportspersons, self-determined motivation and the intention to persist in the sport.

RESEARCH PROBLEM

Although many studies have examined the importance of the coach in the motivational processes of the sportsperson, specifically, no studies have measured the effect of sportspersons' perception of the support of the coach on the satisfaction with the need for autonomy, competence and relatedness. Therefore, the main aim of this study was to test the motivational model of Vallerand, including to seek support for the BPN of competence and relatedness as motivational antecedents, as well as examine the influence of motivational antecedents (perceptions of support and satisfaction of the BPN), on the motivation of and outcomes for sportspersons, such as enjoyment, boredom and intention to persist.

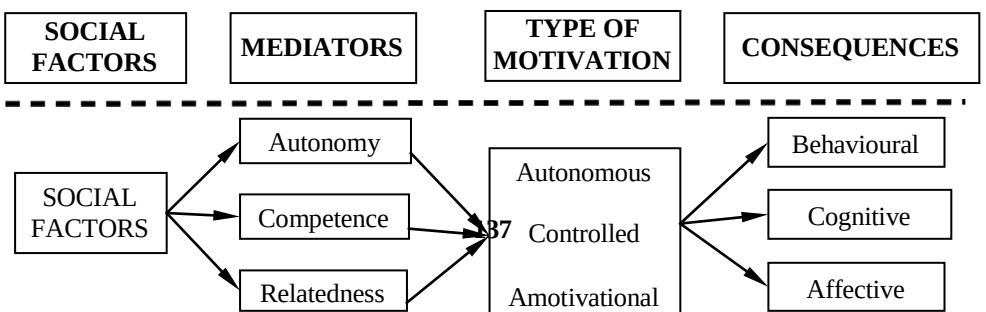


FIGURE 1. **HIERARCHICAL MODEL OF MOTIVATION APPLIED TO GLOBAL, CONTEXTUAL AND SITUATIONAL LEVEL**
(Vallerand, 2007:257)

The following hypotheses were proposed:

- that the perception of sportspersons regarding their need for autonomy, competence and relatedness were supported and would predict greater satisfaction with the three BPN and higher levels of self-determination, enjoyment and intention to persist in the physical activity;
- that high BPN satisfaction among the sportspersons would be a strong positive predictor of autonomous motivation, enjoyment and intention to persist;
- that autonomous motivation would positively predict enjoyment, whereas controlled motivation and amotivation would predict boredom;
- that enjoyment would positively predict and that boredom would negatively predict the intention of sportspersons to persist in the physical activity.

METHOD

Participants

Participants comprised a total of 985 sportspersons from various training categories, ranging in age from 10 to 16 years (14.34±2.52), where 620 of the sportspersons were male, and 365 were female. Participants belonged to 24 different sport codes, including individual (n=452) and team sports (n=533). All participants were from the Extremadura region in Spain. They were systematically and randomly selected by cluster where variables, such as age, gender and the geographical distribution of the sportspersons were taken into account.

Instruments

Basic Psychological Needs Support (BPNS)

To assess autonomy support, competence support and relatedness support, a version of the Basic Psychological Needs Support in Physical Education Scale (BPNS-PE) (Sánchez-Oliva *et al*., 2013), was adapted to the sport context by modifying the introductory phrases. For instance, "During my Physical Education classes, my teacher…" was replaced by "During my training sessions, my coach…". In addition, words referring to a physical education context were replaced by words referring to the sport context. This instrument comprises 12 items, 4 for each of the basic psychological needs of support types: autonomy support ("Often asks us about our preferences with respect to the activities we engage in"); competence support ("Offers us activities based on our skill level"); and relatedness support ("Promotes good relationships between teammates at all times"). This instrument was validated (Confirmatory Factor Analysis), and its internal consistency revealed: χ^2/df=5.12; CFI=0.96; TLI=0.95; GFI=0.96; SRMR=0.04; and RMSEA=0.06.

Perceived Need Satisfaction (PNS)

The Spanish version of the Basic Psychological Needs in Exercise Scale (BPNES)

(Vlachopoulos & Michailidou, 2006; Moreno *et al*., 2008), was used in this study. All references to a physical education context were replaced by references to a sport context ("I think I carry out the tasks effectively" was replaced by "I think I carry out the training effectively"). Participants responded to "During sports practice..." statements by rating the 12 items on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Four items represented each of the basic psychological needs: autonomy ("...we perform exercises that are of interest to me"); competence ("...I carry out the exercises effectively"); and relatedness ("...my relationship with my teammates is friendly"). This questionnaire was validated (Confirmatory Factor Analysis), and their internal consistency revealed: χ^2/df=5.32; CFI=0.95; TLI=0.94; GFI=0.96; SRMR=0.04; and RMSEA=0.06.

Type of Motivation (MPES)

Behavioural regulation types were assessed using an adapted version of the Physical Education Motivation Scale (MPES) (Sánchez-Oliva *et al*., 2012). The original words referring to physical education were replaced by words referring to sport ("I believe it is not beneficial to continue attending physical education classes" was replaced by "I do not believe that it is beneficial to continue attending the training sessions"). The questionnaire contains

20 items, each preceded by the statement, "I participate in this sport...". There are 4 items per behavioural regulation: intrinsic motivation ("Because this sport is fun"); identified regulation ("Because I can learn skills that could be used in other areas of my life); introjected regulation ("Because I feel bad if I am not involved in such activities"); external regulation ("Because I want the coach to think that I am a good athlete"); and amotivation ("But I think that I'm wasting my time with this sport"). Items were rated on a 5-point Likert scale (1=strongly disagree to 5=strongly agree). This instrument was validated (Confirmatory Factor Analysis), and their internal consistency revealed: χ^2/df=4.80; CFI=0.92; TLI=0.91; GFI=0.93; SRMR=0.05; and RMSEA=0.06.

Enjoyment and Boredom (EBSS)

The Enjoyment/Boredom in Sport Scale (Duda & Nicholls, 1992), adapted into Spanish by Baena-Extremera *et al*. (2012), was administered. The original words referring to physical education were again modified ("In Physical Education, I usually hope the class will end quickly" was replaced by "When I practice, I usually hope the training will end quickly"). The original instrument comprised 8 items of which 4 items assessed enjoyment and 4 items assessed boredom. Only 6 items were used in this study because the factorial analysis showed that 2 of the items did not have adequate factor loadings (>.30). This scale was validated (Confirmatory Factor Analysis), and its internal consistency revealed: χ^2/df =6.30; CFI=0.99; TLI=0.98; GFI=0.99; SRMR=0.02; and RMSEA=0.06. All responses were given on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree).

Intention to Persist with physical activity (IPS)

The intention to persist in the sport was measured by the following question: "How long do you think you are going to persist in this sport?". Four choices followed: 1 ("less than 1 year"); 2 ("between 1 and 2 years"); 3 ("between 3 and 4 years"); and 4 ("more than 4 years").

Procedure

In this study, a correlation methodology with a transversal design was applied. The study

received ethical approval from the University of Extremadura. The study followed the American Psychological Association ethics guidelines regarding consent, confidentiality and anonymity of responses. Before data collection, informed consent was obtained from coaches, players and the players' parents and the general purpose of the study was explained. Data collection took place at the clubs in a group setting under the supervision of trained research assistants. Participants completed the questionnaires in the changing room before the start of the training. Thus, the sportspersons were required to be there earlier to complete the questionnaires individually, which took approximately 15-20 minutes. This took place under non-distracting conditions, in the absence of their coach and supervised by the research assistants.

Statistical analysis

The Statistical Package for the Social Sciences (SPSS 18.0) was used to obtain the descriptive statistics and internal consistency estimates for all of the study variables. The Confirmatory Factor Analysis (CFA) was also performed on the data of the questionnaires to test their psychometric properties using the SPSS add-on programme, AMOS. After performing these

2 tests, the Structural Equation Modelling (SEM) with maximum likelihood estimation to test the hypotheses was used.

Using SEM, the multivariate normality of the data, using Mardia's multivariate kurtosis coefficient, was evaluated. First, the measurement model was examined to assess the relationship between the observed indicators and their respective latent constructs. The subscale scores were used as indicators of the need support, need satisfaction, autonomous motivation and controlled motivation latent factors. For amotivation, enjoyment, boredom and importance of participation in sport, 2 parcel items were generated that served as indicators for each respective latent variable.

The model fit index was examined using the chi-square statistic, the Goodness-of-Fit Index (GFI), the Comparative Fit Index (CFI), the Root Mean Square Error of Approximation (RMSEA) and the standardised root mean-square residual (SRMR). A non-significant χ^2 value indicates that the specified model is not significantly different from the data and, thus, is a good fit. Hu and Bentler (1999) proposed that values of 0.90 or higher on the CFI and IFI and values less than or equal to 0.08 and 0.06 on the SRMR and RMSEA, respectively, are indicative of good model fit (Browne & Cudeck, 1993).

DISCUSSION OF RESULTS

Preliminary analysis

First, the questionnaires were validated (CFA) and their internal consistency (Cronbach's Alpha coefficient) established. The internal consistency scores indicated that all of the instruments achieved adequate (between 0.72 and 0.88) Cronbach's alpha values. Specifically, the reliability indexes were 0.78 for autonomy support, 0.72 for competence support and 0.83 for relatedness support. The satisfaction of BPN values were 0.73 for satisfaction of the need for autonomy, 0.76 for the need for competence and 0.83 for the need for relatedness. The motivation scores were: 0.72 for intrinsic motivation; 0.77 for identified regulation; 0.80 for introjected regulation; 0.80 for external regulation; and 0.85 for amotivation. Finally, a value of 0.84 was achieved for enjoyment and 0.88 for boredom.

Descriptive and correlation analysis

Table 1 shows the descriptive statistics. The relationship between the perception of support and the BPN of the sportspersons was strong, with slightly more emphasis on competence support than on relatedness or autonomy, respectively. In addition, a strong relationship was found between satisfaction and the need for relatedness. Furthermore, with the exception of external regulation, high levels of self-determination, progressively decreasing across the motivational continuum, were found. Enjoyment had high scores, whereas boredom yielded modest scores.

The bivariate correlation results showed that each of the perceptions of BPN support variables was positively associated with the 3 BPN satisfaction variables. The 3 BPN satisfaction variables were also positively associated with intrinsic, identified and external regulation, though the association was stronger for the first 2 variables, indicating higher levels of self-determination. Satisfaction with the needs for autonomy and competence, however, was significantly correlated with introjected regulation.

TABLE 1. **DESCRIPTIVE STATISTICS OF AND SIGNIFICANT CORRELATIONS BETWEEN SUBSCALES**

Subscales of constructs	M±SD	1	2	3	4	5	6	7	8	9	1
1. Autonomy Support	3.79±0.89	–									
2. Competence Support	4.50±0.71	0.53**	–								
3. Relatedness Support	4.49±0.69	0.54**	0.71**	–							
4. Autonomy Satisfaction	3.96±0.75	0.62**	0.48**	0.51**	–						
5. Competence Satisfaction	4.34±0.62	0.42**	0.51**	0.55**	0.61**	–					
6. Relatedness Satisfaction	4.59±0.61	0.34**	0.46**	0.58**	0.44**	0.58**	–				
7. Intrinsic	4.54±0.59	0.32**	0.37**	0.41**	0.38**	0.48**	0.40**	–			
8. Identified	4.28±0.71	0.28**	0.37**	0.33**	0.32**	0.41**	0.30**	0.54**	–		
9. Introjected	2.99±1.17	0.16**	0.09**	0.06*	0.17**	0.12**	0.03	0.22**	0.28**	–	
10. External	3.20±1.12	0.18**	0.16**	0.14**	0.20**	0.22**	0.09**	0.30**	0.30**	0.60**	-
11. Amotivation	1.50±0.92	0.10**	-0.06*	0.11**	0.05	-0.08**	-0.11**	-0.16**	-0.07*	0.34**	0.2
12. Enjoyment	4.74±0.57	0.31**	0.42**	0.46**	0.40**	0.54**	0.48**	0.60**	0.40**	0.11**	0.1
13. Boredom	1.44±0.90	-0.02	-0.18**	-0.21**	-0.06	-0.19**	-0.23**	-0.24**	-0.14**	0.20**	0.1

** p<0.01 * p<0.05

Furthermore, amotivation was negatively associated with enjoyment and positively associated with boredom. In addition, amotivation was positively associated with introjected regulation and amotivation. Finally, enjoyment was positively related to all variables, especially the need for competence and intrinsic motivation.

Structural Equation Modelling Analysis

Based on the Self-Determination Theory (Deci & Ryan, 2000; Ryan & Deci, 2000), a structural equation model with the following structure was developed:

(1) the relationship between the sportspersons' perception of the support of the coaches and the 3 BPN acted as the social factors (perception of support to autonomy, competence and relatedness);

(2) the satisfaction of the sportspersons' BPN variables acted as mediators (satisfaction of autonomy, competence and relatedness);

(3) motivational regulation types (autonomous regulation, controlled motivation and amotivation); and

(4) enjoyment, boredom and intention continued to represent consequences.

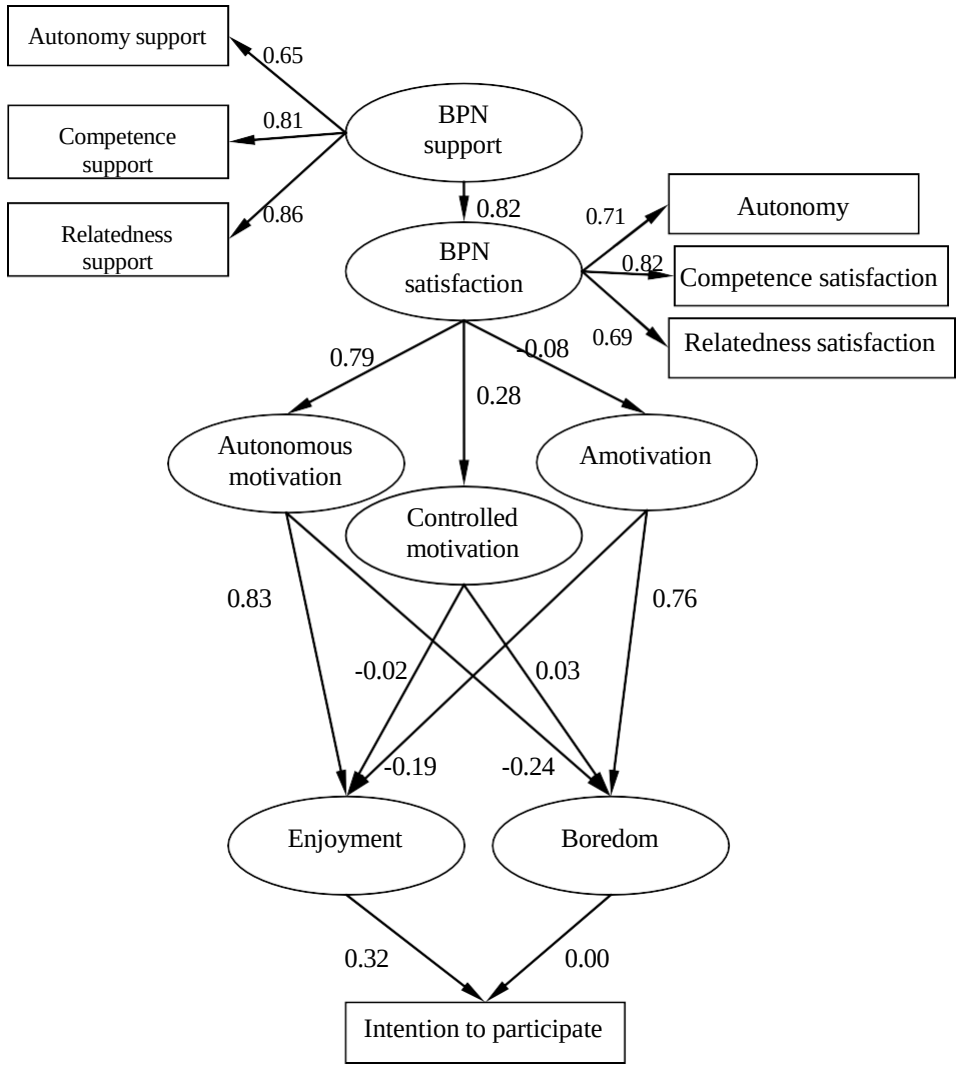
The latent BPN support variables, BPN satisfaction and amotivation yielded 2 parcels with 2 randomly grouped items as indicators. For autonomous motivation and controlled motivation, the average values obtained for regulation types (intrinsic and identified regulation for autonomous motivation and introjected and external regulation for controlled motivation), of each variable were used as indicators. The average values of the 3 items included in each enjoyment and boredom factor, were used as indicators.

To verify the adaptation of the indicated model, a 2-step procedure (Anderson & Gerbing, 1988) was performed. First, a CFA test was conducted to correlate the combination of latent variables. The fit index indicated that the measurement model adequately described the data: χ^2/df =5.02; CFI=0.95; TLI=0.93; GFI=0.94; SRMR=0.07; and RMSEA=0.06.

Secondly, to test the proposed structural equation model, the maximum likelihood estimation method was used in conjunction with the bootstrapping procedure. This process confirmed that the results of the estimators were not affected by the lack of normality, and they were consequently considered to be sufficiently robust (Byrne, 2001). In the initial model, the 3 BPN support variables were associated with the 3 BPN satisfaction variables. Moreover, these 3 variables were associated with the 3 types of motivation. The 3 types of motivation were, in turn, associated with enjoyment and boredom, and these variables were associated with the intention to persist. The model yielded the following data: χ^2/df =5.01; CFI=0.83; TLI=0.80; GFI=0.82; SRMR=0.11; and RMSEA=0.09. These results indicate that the model did not have an adequate fit to the data. Furthermore, in the relationships between the BPN support variables and the BPN satisfaction variables, multi-colinearity problems were found.

The model was, therefore, run again. Specifically, BPN satisfaction as a single latent variable was grouped, while the 3 support variables were isolated with respect to that variable. The fit indexes were as follows: χ^2/df =5.42; CFI=0.85; TLI=0.81; GFI=0.86; SRMR=0.07; and RMSEA=0.15. Therefore, the 3 perceptions of support were also grouped as a latent variable formed by the predictive power of the 3 needs factors. The fit index indicated that the re-

evaluated measurement model adequately fitted the data: χ^2/df=6.56; CFI=0.93; TLI=0.91; GFI=0.92; SRMR=0.06; and RMSEA=0.07.



All standardised estimates $\beta > \pm 0.13$ are significant ($p < 0.05$).
Indicators are not shown for the purpose of simplicity.
BPN= Basic Psychological Needs

FIGURE 2. **STRUCTURAL EQUATION MODEL**

Figure 2 shows the standardised parameters, which indicate that perception of BPN support emerged as a strong positive predictor of BPN satisfaction. Moreover, the model emphasised BPN satisfaction as a predictor of autonomous and controlled motivation, whereas no prediction of amotivation was found. Autonomous motivation then emerged as a positive strong predictor of enjoyment and a negative predictor of boredom. Amotivation, however, positively predicted boredom and negatively predicted enjoyment. Enjoyment emerged as a predictor of the intention to participate.

TABLE 2. **INDIRECT EFFECTS**

Constructs and subscales	Effects
BPN Support	
→ Autonomy satisfaction	0.59
→ Competence satisfaction	0.67
→ Relatedness satisfaction	0.57
→ Autonomous motivation	0.65
→ Controlled motivation	0.23
→ Amotivation	-0.07
→ Enjoyment	0.54
→ Boredom	-0.20
→ Intention to participate	0.17
BPN Satisfaction	
→ Enjoyment	0.68
→ Boredom	-0.25
→ Intention to participate	0.28
Motivation (Intention to participate)	
→ Autonomous motivation	0.27
→ Controlled motivation	-0.00
→ Amotivation	-0.06

The standardised indirect effects (Table 2), which indicate how BPN support positively predicts the 3 BPN satisfaction variables, were also calculated (autonomy: β=0.59; competence: β=0.67; relatedness: β=0.57). Furthermore, BPN support positively predicted autonomous motivation (β=0.65), controlled motivation (β=0.23), enjoyment (β=0.54) and intention to participate (β=0.17). However, BPN support negatively predicted boredom (β= -0.20), whereas BPN satisfaction had a positive indirect effect on enjoyment (β=0.68) and intention to participate (β=0.28) and a negative effect on boredom (β= -0.25). Autonomous motivation had a positive indirect effect on the intention to participate (β=0.27).

DISCUSSION

The main aim of the study was to examine the influence of the motivational processes developed by young sportspersons on enjoyment, boredom and intention to participate. Based on the Self-Determination Theory (Deci & Ryan, 2000), the study demonstrated the importance of coaches in sport adherence by the sportspersons when BPN satisfaction is promoted through the perception of the sportspersons that their needs for autonomy, competence and relatedness are supported.

The first hypothesis proposed that the perception of support would predict greater BPN satisfaction and higher levels of self-determination, enjoyment and intention to persist. The results revealed that sportspersons who perceived that their coaches supported their BPN

showed high BPN satisfaction. Importantly, the support of the coaches promotes autonomy, competence and relatedness in their sportspersons. Similarly, several studies, such as Balaguer *et al*. (2008) and Adie *et al*. (2012), have focused on assessing the importance of significant other individuals besides the direct agent (coach). These studies showed that perceived autonomy support was associated with satisfaction, with autonomy and relatedness needs in sportspersons. Related studies include those conducted by Álvarez *et al*. (2009) and Ntoumanis and Standage (2009), which demonstrated the influence of coaches on the BPN satisfaction of their sportspersons. However, these studies only evaluated perception of autonomy support. Although the results of these studies were significant, in the present study, the three perceptions of support variables emerged as predictors of the general perception of coaches' support variable. However, according to the indirect effects results, apart from the influence of sportspersons' perception of support on BPN satisfaction, these perceptions predicted higher self-determination to practise. This finding suggests that sportspersons, who are supported by their coaches, will have more intrinsic motivation to practise, will derive more enjoyment from the sport and will have stronger intention to persist in the sport.

The second hypothesis suggested that high BPN satisfaction among the sportspersons would be a strong positive predictor of autonomous motivation, enjoyment and intention to persist. The results showed BPN satisfaction emerged as a strong predictor of autonomous and controlled motivation, whereas amotivation was not predicted. In other words, a sportsperson with the freedom to choose, competence and good socialisation in his/her sport code, will have more self-determined reasons to practise. However, if the BPN are not satisfied they will not detract from participation in the activity. Similar results were found by Balaguer *et al*. (2008) and Moreno-Murcia *et al*. (2009). These studies examined whether BPN satisfaction predicted intrinsic motivation. Notably, however, BPN satisfaction does not negatively predict amotivation, which may explain why sportspersons differ between these two variables; being free to choose to participate in training and feeling competent in one's sport do not have to be amotivated. The indirect effects show that amotivation promoted maladaptive consequences, such as boredom, which was also positively predicted by BPN satisfaction. These results confirm that the three variables are related. Finally, BPN satisfaction emerged as a strong indirect predictor of the intention to persist. These findings are consistent with those of Almagro *et al*. (2011), Jõessar *et al*. (2011) and García-Calvo *et al*. (2012).

Regarding the third hypothesis, sportspersons with autonomous motivation experienced greater perceived enjoyment during practice and also had a strong intention to persist, many studies have used the Motivational Hierarchical Model of Vallerand (2001) to explain the influence of social factors and their possibly positive consequences. For example, Balaguer *et al*. (2008) showed that intrinsic motivation was a predictor of both greater self-esteem and life satisfaction. These results suggest that the 5th mini-theory of the Self-Determination Theory is contradictory (Vansteenkiste *et al*., 2010), because the most extrinsic regulations (prestige, fame, social recognition, etc.) lead to high levels of self-esteem. However, this study shows that pursuing aims with greater intrinsic regulation is an antecedent of welfare (enjoyment and intention to persist) and self-esteem, which is not the case for extrinsic motivation. Nevertheless, Balaguer *et al*. (2008) did not assess the influence of the regulation of controlled conduct on possible consequences, either positive or negative. They also did not consider perceptions that sportspersons have of the competence and relatedness support of their coaches. However, the current research shows that the three perceptions of support predicted BPN satisfaction.

Ntoumanis and Standage (2009) and Jõessar *et al*. (2011) concluded that a high level of self-determination was positively associated with a greater commitment to the sport, which might be conceptualised as a greater intention to persist. Specifically, Álvarez *et al*. (2009) concluded that perceived autonomy support positively predicted BPN satisfaction, self-determined motivation and enjoyment and negatively predicted amotivation. Other studies based on the Motivational Hierarchical Model of Vallerand (2001), have found similar results in respect of enjoyment and intention to persist (Almagro *et al*., 2011; García-Calvo *et al*., 2012).

PRACTICAL APPLICATION

Thus, whether the three types of BPN support are antecedents of BPN satisfaction and this satisfaction is an antecedent of self-determined motivation and its consequences (enjoyment, persistence), the support strategies of coaches appear to influence these BPN. Therefore, to improve satisfaction with the need for autonomy, coaches should promote tasks in which participants are given important roles and allowed the power to choose and be leaders in the exercises. To satisfy the need for competence, coaches should adapt their tasks to the level of the sportspersons to make them attainable. These tasks must be purposeful and strike a balance between difficulty and attainability. Coaches should also provide information about individual progress (provide appropriate plans to all sportspersons and give everyone opportunities to achieve the aims). Feedback is especially valuable in this regard (using positive feedback, providing private and significant evaluations and ensuring adequate communication). Finally, to promote relatedness satisfaction, coaches should establish strategies to improve confidence and knowledge (promoting group dynamics, playing role games, optimising the control group, developing adequate communication and promoting abilities in the youth, such as empathy or active listening skills).

LIMITATIONS

This study had several limitations. It provided useful information through an analysis of the perceptions that sportspersons have of their coaches' behaviour in a large sample, allowing the study to generalise about the behaviour of individuals. However, further studies are needed that examine coaches' behaviour first-hand through a qualitative methodology and relate these observations with the motivational perceptions of the sportspersons using a correlation methodology instead of assessing sportspersons' perceptions of support. Furthermore, it might be interesting to investigate whether there are differences in motivational processes between individual and team sport sportspersons. Moreover, teaching programmes should be developed for coaches in a variety of training categories to promote motivational strategies that increase BPN support.

CONCLUSION

In conclusion, taking into account that other studies have focused solely on autonomy support (Balaguer *et al*., 2008; Álvarez *et al*., 2009), this study demonstrated the significance of BPN support as a motivational antecedent of self-determined behaviour. Coaches emerged as a crucial social factor for exerting a positive influence on young sportspersons.

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APPRAISAL OF MEASURING ECONOMIC IMPACT OF SPORT EVENTS

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ABSTRACT

Sport events are big business, attracting not only a large number of participants, spectators and sponsorships, but also wide media coverage. The hosting of sport events have led to increased rivalry between nations, regions and cities. Sport events range from mega events, such as the Olympic Games and the FIFA Soccer World Cup, to endurance events, including the Tour de France and the Comrades ultra-marathon, and even small-scale events, such as cricket and football matches. Since an event creates some spending stimulus, it exerts an impact on the local economy. Researchers worldwide have attempted to quantify this impact of sport events for a number of years, which has resulted in an extensive body of literature on the impact of sport events. This has led to the rationale for this paper, that is, to provide an overview of the research that has been conducted over the past two decades (since 1990), on the economic impact of sport events, with special focus on the

methodological issues pertaining to measuring the impact of sport events. The literature is not unanimous regarding the measurement of spending, or which spending to include. Neither is there consensus about which method to use in the quantification of the impact.

Key words: Sport events; Economic impact; Spending; Input-Output analysis; Multipliers; Computable General Equilibrium Models.

INTRODUCTION

Events, and specifically sport events, have increased globally in number and scope. This implies that from both a private and public point of view, sport events have become more important for various reasons. While the positive aspects of tourism are often highlighted, such as the influence it exerts on economic growth, development, employment creation, as well as foreign exchange earnings, the seasonality of and leakages associated with tourism remains a drawback for the sustainability of these benefits. The hosting of events is regularly viewed as a means to counter seasonality. But it is not the only reason for the competition between nations and cities to host events. Other reasons for the hosting of events include the following: an improvement in the perception or image of the country or city owing to the event; the events as a tool for economic regeneration; the social and cultural benefits; poverty alleviation and job creation; marketing benefits; infrastructure development, to name but a few (Saayman & Rossouw, 2008; Davies, 2010; Saayman & Saayman, 2012; Li & Jago, 2013; Thomson *et al*., 2013).

The term "event" cuts across a spectrum of activities, including cultural, business, recreational and sport activities. It is, therefore, not surprising that a number of journals are

dedicated to reporting research on events. The context, frequency, type of event, type of participation, and the size of events complicate any overview of events and necessitate the demarcation in this and other articles. This article focuses solely on sport events and specifically on the methodology associated with measuring the economic impact of tourism related to various sport events. The aim of the paper is twofold, namely: (1) to provide an overview of the most contentious methodological considerations in measuring the economic impact of sport events; and (2) to analyse the research carried out over the past two decades (since 1990) on the economic impact of such events, again with a specific focus on measuring the impact. While a number of reviews are available, the aim is not to replace these reviews, but rather to complement them by focusing not only on mega events, which is very popular (Kasimati, 2003; Matheson, 2006; Li & Jago, 2013), but to also address the spectrum of sport events. To contextualise this article, it is, therefore, necessary to describe what is meant by "sport tourism" and "sport tourism events", and to explain the classification of sport events that will be utilised in this article.

Kurtzman (1993) was one of the first researchers to do studies in the area of sport tourism and defines it as "the use of sport as a vehicle for tourism endeavours" (Kurtzman, 2005b:15). This emphasises the relationship between sport and tourism. He elaborates that both participants and spectators can be viewed as sport tourists, but that the sporting activity or contest distinguishes this type of tourism from others. Within the field of sport tourism, he distinguishes five categories of activities, namely: (1) events; (2) attractions; (3) tours; (4) sport resorts; and (5) sport cruises. Since then, several other authors have expanded the definition, including Gammon and Robinson (1997) who elaborated on the concepts of sport

and tourism by distinguishing between sport tourism and tourism sport. They further refined both these concepts in terms of hard and soft definitions. However, the focus of this paper falls on sport tourism events, for which the definition offered by Kurtzman since 1993 suffices.

TABLE 1. **TYPOLOGY OF EVENTS**

Category	Size	Frequency	Media coverage	Economic significance	Examples
Type A	Major international	Irregular, one-off	Significant	Large	Olympics, FIFA World Cup
Type B	Major international	Annual	Significant	Large	FA Cup, Grand Slam tennis, Golf Open
Type C	Major international	Irregular, one-off	Limited	Limited	IAAF Grand Prix, World championships
Type D	Major national	Annual	Limited	Limited	National championships

Source: Gratton *et al*. (2000:26)

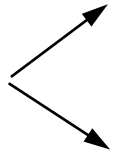
The complexity of sport events is highlighted by the fact that these events range from mega events, such as the Olympic Games and the FIFA Soccer World Cup, to endurance events, including the Tour de France and the Comrades ultra-marathon, and even small-scale events, such as cricket, netball and football matches. Two typologies of sport events can be advanced. Firstly, Gratton *et al*. (2000) typify sport events in four categories according to their size, regularity, media interest and economic significance. Table 1 elaborates on the four types of sport events identified by them. Their categorisation is mainly based on what they call „major" events, which is a shortcoming already identified by Wilson (2006) who adds a Type E event to this framework. He defines Type E events as "minor competitor/spectator events, generating very limited economic activity, no media interest and part of an annual domestic cycle of sport events" (Wilson, 2006:68).

Secondly, Barget and Gouguet (2007) argue that sport has become a private good, rather than a public good and, therefore, any economic analysis of sport events should consider the nature of the event as an economic good. They propose three metrics according to which sport events should be typified, namely frequency, economic weight (including size) and ownership (public versus private).

FREQUENCY **SIZE** **OWNERSHIP** **EXAMPLES**

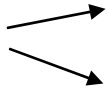
Sporadic events

Ordinary

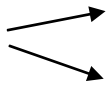


Mega

National Private



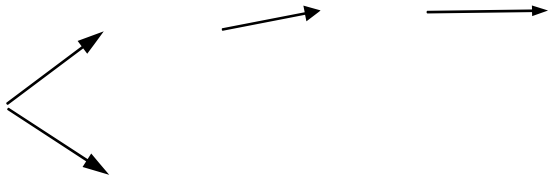
National Private



Davis cup Tennis

Indian Premier League Cricket

FIFA Soccer World Cup



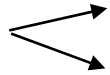
Ordinary

National

Regular events

Mega

National



Private

FIGURE 1. **TYPOLOGY OF SPORT EVENTS II**

Source: Barget and Gouguet (2007:167)

Figure 1 presents an exposition of sport events according to this typology. In terms of occasional events, a distinction is drawn between events that attract the general public and those that attract a very specialised and knowledgeable audience. This implies that some events may possess high societal utility even though they may yield insignificant economic benefits, while other events offer major economic benefits, but little societal utility.

This paper contributes to other reviews in this field by not only focusing on mega events that are often reliant on public funding, but also on ordinary and smaller events (Type E), which in most cases are privately funded. In some cases, these events are more frequent, because they take place on a much more regular basis. Recently Dixon *et al*. (2013) confirmed that research on the economic impact of mega events outnumber that of small-scale sport events, which highlights the need for further research in this area. Higham (1999:87) contributes to this classification by defining small-scale sport events as "regular seasonal sporting competitions (ice hockey, basketball, soccer, rugby leagues), international sporting fixtures, domestic competitions, Masters or disabled sports, and the like". In addition, certain papers also add mass participation (recreation) events, which are not generally captured in the typologies above, yet once again play an important role in sport and tourism. Within this framework, the paper addresses both the methodological considerations when measuring the economic impact of a sport event, as well as an analysis of the empirical evidence on the economic impact of sport events.

Based on the above, the authors argue that there are specific classifiers that play a key role in influencing the economic impact that an event has on the economy, and that these can be viewed as building blocks. For the purpose of this paper, the classification of events is performed according to the following framework (Figure 2).

Classifiers	*Ownership*	Government	Federation/ Club	Private
	Frequency	Weekly/ monthly	Annually	Occasionally/ irregularly
	Participants	Professional	Amateur	Recreational
	Type of participation	Individual	Team	
	Length	One day	<Week	>Week
	Economic Scope	National	Regional	Local
	Size	Major	Medium	Small
	Sport events			

FIGURE 2. **BUILDING BLOCKS FOR CLASSIFICATION OF SPORT EVENTS**

Probably the most contentious building block is the first distinguishing factor, namely the size of the event. The definition offered by Li and Jago (2013), that major sport events consist of mega events (Olympic Games, Soccer World Cup, Super Bowl), as well as hallmark events (Commonwealth Games, World Championships), has relevance for this article. Taks *et al*. (2011) define a medium-sized sport event as one where a large contingent of spectators consists of local inhabitants, while the participants may comprise a mixture of local and non-local people. This type of event to some extent corresponds with Type C sport events, according to the definition by Gratton *et al*. (2000), and also to the „ordinary' events in the definition of Barget and Gouguet (2007). In our view, mass participation (recreational) sport events that attract international participation also fall into this category. Small-scale events are defined by Dixon *et al*. (2013:98) as "competitions with small local fan bases and/or competitions that attract national and international interest", with the description by Higham (1999) offering some examples of these events. Daniels and Norman (2003) indicate that a distinctive feature of small-scale events is that they rely on the existing infrastructure and, therefore, require little government investment.

The second distinguishing feature is the scope of the event, that is, national, regional or local. This, together with the third building block, the duration of the event, provides a refinement of the first feature, namely the size of the event. Furthermore, the type of participation (team or in individual), as well as the level of competence of the participants (professional, amateur, recreational), are distinguishing features of the events.

The remainder of this article is structured as follows: to shed light on the key methodological considerations and contentious questions in economic impact analyses; summarise and analyse peer-reviewed research on the economic impact of sport events between 1990 and 2003 in the light of the issues identified; and finally present the main findings and conclusions.

KEY CONSIDERATIONS WHEN ASSESSING ECONOMIC IMPACT OF SPORT EVENTS

Determining the economic impact of tourism has gained popularity after the seminal work carried out by Brian Archer (1977) on tourism multipliers, which has led to an increase in research on the impact of tourism on the economy. The application of economic impact studies in tourism is especially useful to informing decisions on tourism development (Kottke, 1988), and this has naturally extended to the hosting of special events.

Tyrrell and Johnston (2006:3) explain that in tourism, economic impact analyses "estimate changes in regional spending, output, income, and/or employment associated with tourist policy, events, facilities, or destinations". The impact originates from an increase in spending in the region, which in this case, is due to the hosting of a sport event. Lee (2001:n.p.) broadly defines the economic impact of a sport event as "the net change in an economy resulting from the sport event", where „change" refers to the metrics as described by Tyrrell and Johnston (2006). However, with the wide application and clear policy decisions that impact studies have, it is not surprising that it has been misused for political agendas. Most of the said studies are aimed at gaining public support and subsidies to host mega events rather than academic contributions (Dixon *et al*., 2013). A number of papers have addressed these misuses and misconceptions of economic impact studies with some devoted solely to this matter, including two studies conducted by John Crompton (1995 & 2006), one by Abelson (2011), and even a stern word of warning from Brian Archer (1996), who cautions about „garbage in, garbage out". This is especially true for the input to economic impact studies, namely the initial increase in spending.

Although very reliant on the initial input (the spending stimulus), the methodological considerations in measuring the economic impact of events are not limited to the question of which spending to include. Firstly, the misuse of the term „economic impact" needs to be considered, since there are vast differences between concepts, such as economic value, economic significance, cost-benefit analysis and economic impact analysis that are not consistently applied in impact studies. Measuring the initial spending stimulus raises concerns regarding which spending to include, the demarcation of the study area, the collection of the data and the calculation of the direct spending. The last contentious methodological question relates to the method for calculating indirect and induced impacts. These themes are further explored under suitable sub-headings. It is especially the first and the last of these methodological concerns that feeds into the empirical analysis of studies addressing the economic impact of sport events.

Difference between economic significance, economic impact, economic value and cost benefit

While the terms „economic impact", „economic benefit", „economic value" and „economic significance" are often used as synonyms, there is a clear difference among them and are often misunderstood by those who apply them. Economic benefit is often derived using a cost-benefit framework. Two influential papers that exploit the differences between cost-benefit analysis and economic impact analysis are those of Burgan and Mules (2001) and Tyrrell and Johnston (2006).

Burgan and Mules (2001:323) explain that cost-benefit analysis was developed with the aim to "evaluate alternative uses of public funds from an economy-wide perspective". Various alternative (but similar) projects are subsequently compared to one another and the option with the highest benefit relative to the cost ratio should be adopted as the preferred use of public funds. Tyrrell and Johnston (2006) add that cost-benefit analysis essentially estimates

the net economic benefit to be derived from an event and it is, therefore, mostly an *ex ante* analysis. Since the result of the analysis is a net benefit, it can be linked to welfare gains for the community at large (Abelson, 2011). Such an analysis, therefore, extends beyond the tangible benefits to include intangible benefits (excitement, increased exposure, after-event-tourism growth), that can be measured using willingness-to-pay or other contingent valuation methods (Burgan & Mules, 2001).

„Economic value" is a concept closely related to „economic benefit", since it refers to the "total societal benefit" of an event (Moore *et al*., 1994:63). According to Barget and Gouguet (2007), the total economic value of a sport event consists of the use value and the non-use value of the event. The non-use value, also called intrinsic or existence value, can be defined as "the utility a person derives from knowing that the event exists" (Barget & Gouguet, 2007:170). The use value consists of the actual use value, the optional value and the legacy value. The actual use value refers to the utility that the consumers actually feel owing to the sport event, while the potential value is the utility owing to future benefits than can be derived from the event. The satisfaction of preserving the event for future generations is the legacy value. Methods often used to assess the economic value of an event is the travel cost method, hedonic pricing and contingent valuation.

Contrary to cost-benefit analysis, economic impact analysis measures the change in economic activity owing to the event and is, therefore, rather an *ex post* analysis. Tyrrell and Johnston (2006:3) explain that it is "not designed to identify those policies or situations that generate optimal social benefit". Burgan and Mules (2001) agree that the two paradigms that govern the two analyses differ, but argue that economic impact analysis can be consistent with cost-benefit analysis when the economy is not at full employment of resources. However, they continue to state that economic impact analysis is "an appropriate methodology to assess what is essentially a major source of benefit of a special event" (Crompton, 2006:327). Crompton (2006) adds that as soon as cost is included in the analysis, it changes from an economic impact to a cost-benefit analysis.

Compared to an economic impact study, the economic significance of an event does not quantify the loss in economic activity if the event did not take place. It rather measures the size of the event and its associated economic activity and, therefore, offers some useful information when trade-offs are involved (Crompton, 2006). This is especially relevant when local spending is included in the analysis and many economic impact studies conducted by consultants are rather studies of economic significance. This naturally leads to the question of what spending should be included in an economic impact analysis.

Spending to include

Economic impact stems from spending that takes place in the economy that would otherwise not have taken place. According to Hodur and Leistritz (2006), spending stems from three main sources: (1) facility construction; (2) facility or event operations; and (3) participants and spectators who attend the event.

The first, facility construction, is a once-off expense creating once-off benefits that are not associated with all sport events, but regularly with mega events. Recently, Matheson (2012) evaluated the impact of infrastructure development for mega-events in emerging economies since the construction of stadiums and sport halls for these events represents a huge cost to the local taxpayer, even though the benefits may also be substantial. The second source of

spending relates to normal business operations and includes supplies, advertising, maintenance, etc. (Hodur & Leistritz, 2006). Both these types of expenses are easy to account for and are used in an economic impact analysis.

Finally, accounting for spending by event attendees is essential. These attendees include, amongst others, sportspersons and coaches, spectators, media representatives, members of broadcasting companies, sponsors and exhibitors (Smeral, 2003). The expenses incurred include travel costs, food, accommodation and other purchases owing to the event (Hodur & Leistritz, 2006). Smeral (2003) distinguishes between gross impact and incremental impact, where the former refers to the impact derived from all event-related expenditure, irrespective of the origin of the spending. Incremental spending, or effective demand, only accounts for spending sourced from outside the study area. Both investment and expenditure by local firms and residents are, therefore, excluded from calculating the incremental impact, since they do not create effective demand.

The most contentious spending is that of the attendees of the event, both in how to obtain it and which spending to include. Since it is only non-resident spending that creates effective demand, the inclusion of local or resident spending is dubbed by Crompton (2006:70) as being the "most frequent mischievous procedure" followed in economic impact studies. In essence, the event causes a divergence of only local expenditure to other sectors of the local economy. However, Crompton (2006) identifies two situations in which it would be acceptable to include local spending: (1) when the aim of the study is to determine the economic significance of the event; and (2) when locals who would have left the area rather stay at home in order to attend the event. The latter is referred to as deflected impact, since the local spending would have been incurred at another venue. However, measuring the deflected impact is quite difficult and is, therefore, often rather excluded from the economic impact analysis.

Two other visitor types that should be treated with care are distinguished by Crompton (1995), namely „time switchers' and „casuals'. The former refers to visitors who have been planning to visit the city or region, but planned their visit to coincide with the sport event hosted in the region or city. Casuals, on the other hand, are visitors who are in the city or region for another purpose, and attend the event. The main purpose of their visit is, therefore, not the sport event as such, but that they attend it because they are in the vicinity. Crompton (1995) argues that the expenditure of time switchers and casuals should be excluded from an economic impact analysis, since it represents money that would have entered the economy irrespective of whether the event took place. However, if the event causes these visitors to extend their stay, it can be argued that their spending at the event may be included in the economic impact analysis.

Gelan (2003) argues that although public expenditure on infrastructure falls into the same category as local spending, it might represent incremental spending for events hosted in smaller areas. These areas consequently attract spending from regional and national government for the upgrading or construction of infrastructure, which would not have accrued to them had the event not been hosted in the region.

Study area

The above-mentioned indicates that a clear demarcation of the study area is a necessity when the economic impact of any event is considered. Impact studies can either focus on the

national, regional or local economy and the size of the event clearly exerts an influence on this choice. Hodur and Leistritz (2006) reveal that there are two important considerations when choosing the study area: (1) the study area should represent a trade area; and (2) it should include the locations where most of the expenditure associated with the event takes place. This suggests that for small towns that host events and draw on neighbouring towns for accommodation supply, the regional rather than the local impact should be considered.

According to Agha and Rascher (2013), the economic impact of sport events in more geographically isolated areas is more pronounced. This may be attributed to the following: (1) more export revenues are created since there are not many competing facilities in the region; (2) any person in this remote region that wishes to attend a live game will have to travel to the town with the facility available, thus creating an influx of visitor spending; and

(3) locals are more likely to stay in the town in order to attend the sport event, thus increasing the deflected impact of the event.

Defining the study area too widely or too narrowly can have important implications for the outcome of the impact study. An area that is too wide leads to the exclusion of spending by visitors from these areas, thus decreasing the incremental spending influx. A definition of the study area that is too narrow also leads to losses in spending that accrue to the local area, namely the initial spending stimulus. As explained by Stynes (2001), only spending that accrues to the local area should be captured in the economic impact assessment, implying that spending on goods and services from outside the study area should be excluded. He proposes the use of „capture ratios' to capture only the spending on those souvenirs and other items that are provided by firms and locals in the study area.

Primary data collection

Wilton and Nickerson (2006:17) state that "while measures related to economic impact assessment are conceptually simple, the actual collection of such information is extremely difficult". Since most of the incremental spending due to the event stems from visitors, it entails the collection of primary data and an estimation of visitor numbers. However, spending is not always determined via primary data collection. While other methods are used to obtain expenditure via Tourism Satellite Accounts (TSA) or other accounting models, direct surveying remains the most accurate means to obtain estimates of expenditure.

The method used in surveying, as well as the content of the survey are contentious issues that are often neglected in the literature. Stynes and White (2006) and Wilton and Nickerson (2006) provides an overview of the most contested issues in this regard. It is argued that collecting spending data close to or at the event reduces recall bias and telescoping (including expenditure beyond the study area), in spending estimates. Typically, recall bias leads to an underestimation of spending, and research carried out by Breen *et al*. (2001) indicates that recall bias is found even in exit interviews, that is, when attendees exit the event. Surveying at the event is, therefore, preferred, although it may be costly and be subject to substantial time constraints (Ryan, 1998; Wilton & Nickerson, 2006).

To improve the estimate of the initial stimulus, Stynes and White (2006) propose the inclusion of various spending categories, as well as the segmentation of visitors into distinct classes. The details of the spending categories included in the survey should cover spending on lodging, food and beverages, transport, recreation and entertainment, souvenirs and retail

products. Furthermore, the survey should include the number of days spent, as well as the size of the travel party to be able to determine spending per day and per person.

Segmenting the visitors into various categories, namely spectators versus participants, overnight visitors versus day visitors, or according to origin, not only provides a more efficient sample design, but also renders it easier to distinguish between spending that should and should not be included in the analysis (Stynes & White, 2006). Saayman *et al*. (2005) show that segmenting visitors before determining the economic impact does not necessarily lead to a decrease in spending and economic impact, but can actually have the opposite effect.

To determine total spending, the total number of visitors needs to be known. This is not an issue in events where tickets are needed or other access controls are in place before the event is attended. However, for a number of amateur sport events or even attendance at major uncontrolled events (such as the New York marathon or the Tour de France), the number of visitors is not that evident. The participants need to register for these events, but the spectators need to be estimated. Hodur and Leistritz (2006) list a number of methods that can be considered, including a survey of the spectators, the Capacity Utilization Model[1] and the attendance at closing and opening ceremonies.

Estimating direct economic impacts

Ryan (1998) asserts that it is important to make sure that one does not calculate total visitor expenditure (or gross expenditure) due to the event, but rather the extra spending that would not have taken place in the city or region if the event did not occur. Smeral (2003) refers to this as incremental spending. This implies that all the issues raised above should be incorporated into one framework to ensure the correct calculation of the direct impact of the event. The analytical framework proposed by Stynes (1999), adapted and applied by amongst others Gelan (2003) and Saayman *et al*. (2005), makes provision for all the corrections to visitor spending discussed above, is presented in Table 2.

TABLE 2. **ANALYTICAL FRAMEWORK FOR ESTIMATING DIRECT IMPACT OF VISITOR SPENDING**

Equation description	Number
$S = V_e\Sigma_j\lambda_{v,j} + L_s\Sigma_j\lambda_{l,j}$	(1)
$V_e = \phi V$	(2)
$L_s = \psi L$	(3)
$\lambda_{v,j} = \delta_{v,j}\beta_{v,j}$	(4)
$\lambda_{l,j} = \delta_{l,j}\beta_{l,j}$	(5)
$S = \phi V\Sigma_j\delta_{v,j}\beta_{v,j} + \psi L\Sigma_j\delta_{l,j}\beta_{l,j}$	(6)
$DS = \sigma(\phi V\Sigma_j\delta_{v,j}\beta_{v,j} + \psi L\Sigma_j\delta_{l,j}\beta_{l,j})$	(7)

Source: Adapted from Gelan (2003:414)

Equation (1) indicates that total spending (S) is the sum of both local (L_s) and visitor (V_e)

average spending. These, $\lambda_{v,j}$ and $\lambda_{l,j}$, represent the average expenditure on spending category j per visitor and local respectively. Both the number of visitors in each category (L_s and V_e) and the average spending ($\lambda_{v,j}$ and $\lambda_{l,j}$) per category are further explained in equations (2) to (4). Equations (2) and (3) express L_s and V_e as proportions of total visitors (V) and total

[1]This entails a survey of the accommodation units to determine the percentage of non-local visitors attending the event.

residents (L) respectively, with ϕ and ψ representing the corresponding ratios. Note that ϕ indicates the ratio of visitors who are in the town or region due to the event, while ψ is the ratio of locals that remained in town because of the event (deflected impact). Similarly, the amount of average expenditure on each category, $\beta_{v,j}$ and $\beta_{l,j}$, should be weighted using the proportions that are incurred by the local community, $\delta_{v,j}$ and $\delta_{l,j}$ (equations 4 and 5). By substituting equations (2) to (5) into equation (1), total spending is defined in equation (6).

A scalar capture ratio σ is included to account for „imported products" bought by visitors and locals. Equation 7, thus, indicates the direct sales effect on the local economy; the most important economic impact indicator in the local study area.

Total economic impact determination

Once the direct incremental spending due to the event is determined, the indirect and induced effects of this spending on the city or region should be determined. This has been a subject of much controversy, which has picked up steam over the past decade with avid believers in the superiority of some methods compared to others. However, while this aspect is often emphasised, Brian Archer"s warning of "garbage in, garbage out" should not be discarded.

Two main methods used to assess the total economic impact of an event are input-output (I-O) models (and variants thereof), and Computable General Equilibrium (CGE) models. However, Li and Jago (2013) mention that some use of econometric models can be found in the literature (Kasimati & Dawson, 2009), and that it is surprising that it is not used more often in conjunction with CGE models in particular.

Input-output models have traditionally been the most popular method used in economic impact studies. They use matrix algebra to determine the income, employment and production that are necessary to satisfy a certain level of demand (Kottke, 1988). I-O models generate multiplier estimates, which are subsequently applied to direct incremental spending estimates in order to quantify the secondary effects of the event. The uses, abuses and misinterpretation of multipliers (Crompton, 2006), have led to distrust in the results generated from these models. Many variants of I-O models are available and have been applied in economic impact studies, including: (1) Social Accounting Matrices (SAM), which is an extension of the I-O model to include different household segments; (2) regional I-O models, such as RIMS II and IMPLAN, which are designed for a specific region; and (3) partial I-O models, which generate proportional multipliers. The latter has seldom been applied to sport events research, although it is quite popular in other rural tourism settings.

I-O models have been widely criticised, and the main criticisms raised include the following (Dwyer *et al.*, 2005; Abelson, 2011): (1) no resource constraints are taken into account, and

therefore, no crowding out takes place; (2) price effects are ignored; (3) constant proportions between inputs and outputs are assumed; and, therefore, (4) they deliver only positive impacts.

CGE models have their foundation in neo-classical micro-economics and consist of a number of equations that describe the various relationships within the economy (Song *et al*., 2012). Dwyer *et al*. (2005:353) describe them as constituting "current best practice in assessing

economy-wide changes in expenditure within an economy". In a CGE model, the economy is modelled as a system, with realistic assumptions of resource constraints, price adjustments and inter-linked markets (Dwyer *et al*., 2005). The CGE model is estimated from a base year and the assumptions used influence the outcomes that the model predicts. These assumptions include the source of capital, the availability of labour and whether unit cost is rising or falling (Abelson, 2011). Although Dwyer *et al*. (2006a) argue that CGE models can be applied to events of all sizes and also for once-off events, Abelson (2011) doubts their application to these types of events. This sentiment is echoed by Taks *et al*. (2011) who state that smaller events are less likely to have crowding out effects and do not distort normal business patterns very easily, thus rendering I-O type analyses more accurate. Li and Jago (2013) confirm that event impacts using CGE modelling have focused primarily on major events.

The use of CGE versus I-O have been debated for more than a decade, with one of the early comparisons provided by Zhou *et al*. (1997), for tourism to Hawaii. They show that the main advantage lies in the flexibility of CGE models, especially in resource allocation, and found lower total impacts using this model compared to those of the I-O model. This sentiment is echoed by Dwyer *et al*. (2005, 2006a), who have made extensive contributions to research regarding the application of CGE modelling in tourism. The differences in assumptions underlying I-O and CGE models are summarised by Dwyer *et al*. (2005), and presented in Table 3 below. The flexibility that CGE models offer is clearly visible in this comparison.

TABLE 3. **ASSUMPTIONS UNDERLYING I-O AND CGE MODELS**

I-O model assumptions	CGE model assumptions
All final demand components are exogenous	All main final demand components are endogenous
Capital, labour and land is endogenous	Capital and land are given exogenously
There are no price-induced substitution effects	Price-induced substitution effects occur
Government expenditure remains constant and is exogenous	Government budget deficits are fixed
Employment is perfectly elastic (flexible)	Employment can be regarded as fixed or flexible

Source: Dwyer *et al*. (2005:354)

While the literature mainly follows the process described above, that is, using micro survey data to compute the direct effect augmented with either input-output analysis to analyse the indirect and induced effects, there is another form of *ex post* analysis that follows a very

different process in determining the effect of an event on an economy, namely regression analysis. This type of analysis is especially popular in the USA, championed by Victor Matheson (often in co-operation with Robert Baade). This method compares the performance of a city or region during the event with that of cities or regions that have not hosted the event, or with the same city/region prior to the event. The performance is measured using

common economic performance measures, such as personal income, income per capita, employment and taxable sales (Matheson, 2006). This method normally entails the estimation of time series models (Baade & Matheson, 2004), although cross-section regressions and panel regressions are also used (Tien *et al.*, 2011), especially when more than one hosting city or event is analysed.

When regression analysis is considered to assess the economic impact of an event, the following considerations should be kept in mind: (1) it is often difficult to isolate the economic impact of an event which takes place within a large, diverse metropolis and normal business fluctuations may obscure the impact of the event; (2) the event has to be isolated within space and time (identifying the study area is again paramount); (3) monthly and quarterly data should be used rather than annual data, since the effect of the event tapers down with time; and (4) it is more difficult to detect the effect of recurring and regular events than single events when using this method (Matheson, 2006).

EMPIRICAL LITERATURE ANALYSIS

To compile a list of the publications that focus on the economic impact of sport events, a search was conducted using the following search engines: Google Scholar, Science Direct and within the following databases of EbscoHost: Academic Search Premier, Business Source Premier, EconLit, and Hospitality and Tourism Index. In addition, South African publications were sought using Sabinet. For the purpose of this article, only published journal articles were considered (no books or working papers are included). The literature under review was augmented by electronic searches using the recent reviews offered by Matheson (2002), Hodur and Leistritz (2006), Matheson (2006) and Li and Jago (2013).

The key words included in the search were „economic impact" and „sport event" and for the academic databases, these words had to appear in the abstract. The searches identified a total of 81 journal publications between the years 1990 and 2013[2]. By scrutinising the above reviews, an additional 14 journal articles were added to the current list.

The analysis was performed using the classification as described in the introduction and by focusing on the various aspects, as identified in the review of the methodological concerns raised above. Firstly, a general overview is presented.

General analysis of all the articles

Figure 3 illustrates the distribution of articles over the various years under consideration. It is evident that the published research increased significantly during the first decade of 2000, after which it showed a noticeable decline to reach levels similar to that of the 1990s after 2010. The year 2006 logged a record number of publications, namely 17 in total. This can be partially attributed to the special edition published by the *Journal of Travel Research* on the economic impact of events. It is interesting that no scientific contributions could be found for

the years 1997 and 1999.

[2]This includes sources that do not offer electronic full-text.

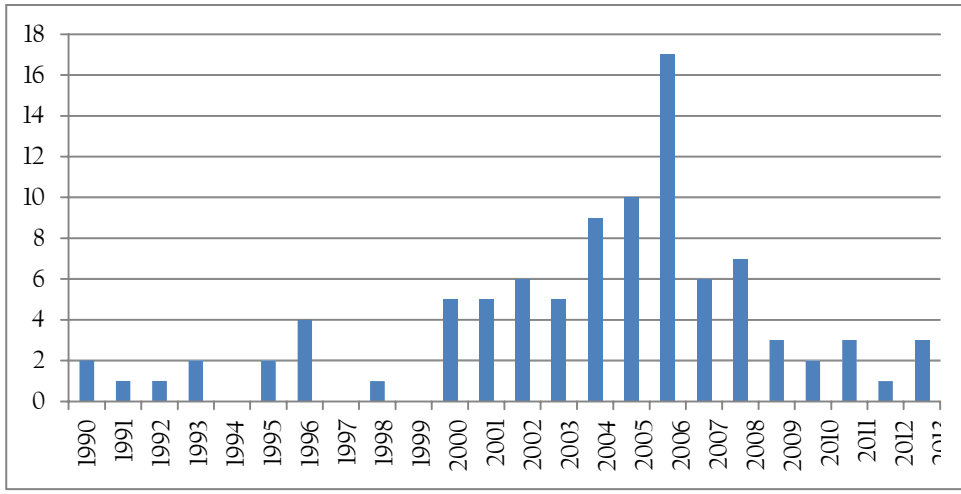


FIGURE 3. **NUMBER OF ARTICLES PUBLISHED PER YEAR**

The articles are further classified as either a case study of small, medium or major events, or as reviews or articles that deal with methodological issues.

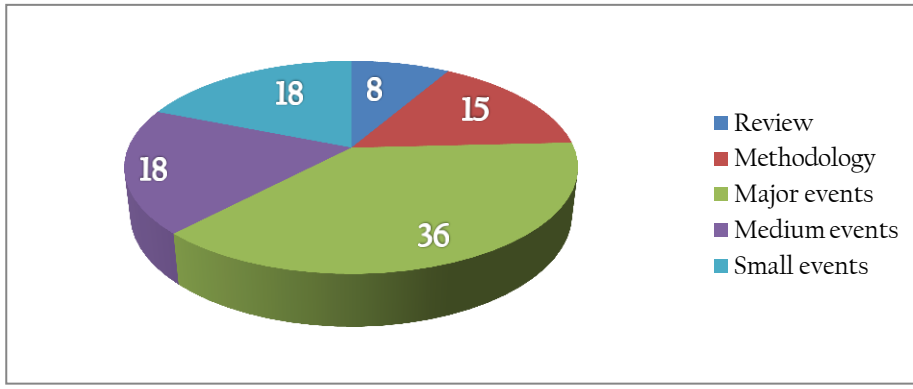


FIGURE 4. **DISTRIBUTION OF ARTICLES ACCORDING TO TYPE**

An analysis of the total number of articles (Figure 4) reveals that the majority deal with major events (38%), which is not surprising since major events often attract large audiences and rely on public funding. This excludes reviews that also mainly focus on major events. It is also interesting that 15 articles (almost 16%), deal with methodological issues, indicating both the large number of aspects to consider, as well as the different views available on determining the economic impact of sport events. Figure 5 illustrates the distribution of the total number of articles between the various types described above.

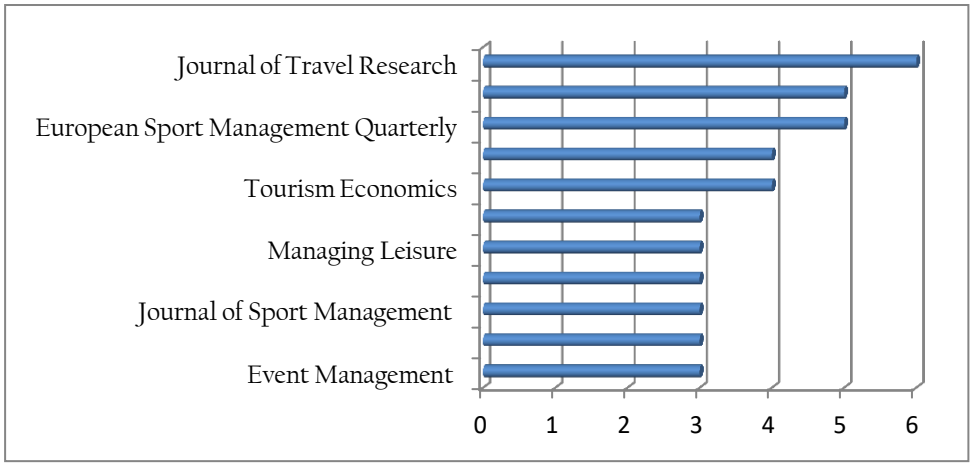


FIGURE 5. **DISTRIBUTION OF ARTICLES AMONG JOURNALS**

The distribution of publications amongst journals is also worth noting, with the research attracting interest from tourism, event, leisure and sport journals. Figure 5 illustrates the number of articles published in various journals over the past 24 years (1990-2013). Only journals that had published at least three articles on the economic impact of sport tourism are shown in the graph.

It is evident (Figure 5) that the special issue on the economic impact of events, published by the *Journal of Travel Research* in 2006, places this journal on top of the list, with a total number of six articles having been published on this topic. The sport journals, *Journal of Sports Economics* and *European Sport Management Quarterly* follow with five articles each, after which the tourism journals, *Annals of Tourism Research* and *Tourism Economics*, take the third position with four articles each.

Table 4 presents an overview of the review articles published since 1990. In 1992, the first review was published by Burgan and Mules, and in their article they furnish an overview of the calculation of direct spending, as well as the use of input-output models to generate multipliers. This is followed by two very brief reviews by Lee (2001) and Matheson (2002); it is apparent why Li and Jago (2013) refer to these reviews as "early reviews".

Between 2003 and 2006, four review papers focusing on the modelling of the economic impact of sport events were published, with Dwyer, Forsyth and Spurr contributing two papers on the comparison of CGE and I-O modelling. Hodur and Leistritz (2006) provide a more comprehensive review dealing with the various issues associated with the economic impact analysis of sport events. Li and Jago (2013) refer to this period as being the „dynamic development" of economic impact analysis. The last review was published as recently as 2013 by Li and Jago, but focuses only on the reviews to date and major sport events.

TABLE 4. **REVIEW ARTICLES**

Description	Author(s)	Journal
Direct spending calculation, Input-output modelling	Burgan, B & Mules, T	*Annals of Tourism Research* (1992)
Brief review	Lee, S	*The Sport Journal* (2001)
	Matheson, VA	*The Sport Journal* (2002)
Review of modelling, assess Olympic empirical findings	Kasimati, E	*International Journal of Tourism Research* (2003)
Comparison of CGE IO, Application Australian Grand Prix	Dwyer, L, Forsyth, P & Spurr, R	*Journal of Travel Research* (2005)
	Dwyer, L, Forsyth, P & Spurr, R	*Tourism Review International* (2006b)
Review of issues	Hodur, NM, & Leistritz, FL	*Journal of Convention & Event Tourism* (2006)
Review of issues and major events	Li, S & Jago, L	*Current Issues in Tourism* (2013)

Table 5 outlines the published articles that address various theoretical and methodological issues pertaining to the economic impact of sport events. A number of key contributors to the methodology and theory are worth mentioning: Trevor Mules contributed three articles, while John Crompton and Larry Dwyer both contributed two articles. One of the most cited articles that influenced practices on the economic impact of sport events is that produced by Siegfried and Zimbalist (2000).

TABLE 5. **METHODOLOGY AND THEORETICAL ARTICLES**

Title	Authors	Journals
Economic impact analysis of sports facilities and events: Eleven sources of misapplication	Crompton, JL	*Journal of Sport Management (1995)*
The economics of sport facilities and their communities	Siegfried, J & Zimbalist, A	*Journal of Economic Perspectives (2000)*
An economic perspective on special events	Mules, T & Faulkner, B	*Tourism Economics (1996)*
A framework for assessing tangible and intangible impacts of events and conventions	Dwyer, L, Mellor, R, Mistilis, N & Mules, T	*Event Management (2000)*
A framework for assessing direct economic impacts of events: Distinguishing origins, destinations, and causes of expenditures	Tyrrell, TJ & Johnston, RJ	*Journal of Travel Research (2001)*

TABLE 5. **METHODOLOGY AND THEORETICAL ARTICLES (*cont.*)**

Title	Authors	Journals
Comparative economic impact analysis: Differences across cities, events, and demographics	Mondello, MJ & Rishe, P	*Economic Development Quarterly (2004)*

Do we need an economic impact study or a cost-benefit analysis of a sports event?	Kesenne, S	*European Sport Management Quarterly (2005)*
Economic impact: Sport tourism and the city	Kurtzman, J	*Journal of Sport Tourism (2005a)*
Sport and economic regeneration in cities	Gratton, C, Shibli, S & Coleman, R	*Urban Studies (2005)*
Local business leveraging of a sport event: Managing an event for economic benefit	Chalip, L & Leyns, A	*Journal of Sport Management (2002)*
Public sector support for sport tourism events: The role of cost-benefit analysis	Mules, T & Dwyer, L	*Sport in Society (2005)*
Economic impact studies: Instruments for political shenanigans?	Crompton, JL	*Journal of Travel Research (2006)*
Sport events: uses and abuses of economic impact studies	Jeanrenaud, C	*Finance & the Common Good (2006)*
Central place theory and sport tourism impacts	Daniels, MJ	*Annals of Tourism Research (2007)*
The economic impact of sports, sporting events and sport tourism in the UK: The DREAM model	Gibson, H, McIntyre, S & MacKay, S	*European Sport Management Quarterly (2005)*

Major event analysis

Table 6 presents a description of the 36 articles based on major sport events for the period 1990 to 2013. It is evident that the case studies and literature are dominated by studies on the Soccer/Football World Cup (16 articles), as well as the Olympic Games (13 articles). The economic impact of American Football (the Super bowl) is also well documented, with Victor Matheson being the main researcher in this regard. Relatively less attention is devoted to major events such as the Commonwealth Games, the Tour de France and EURO Cup Soccer.

TABLE 6. **ARTICLES ON MAJOR SPORT EVENTS**

Sport events	Authors	Journals
American Football	Baade, RA & Matheson, VA	*Reflets et perspectives de la vie économique (2000a)*
	Coates, D & Humphreys, BR	*Journal of Sports Economics (2002)*
	Matheson, VA	*Journal of Sports Economics (2005)*
	Matheson, VA & Baade, RA	*European Sport Management Quarterly (2006)*
	Baade, RA, Baumann, R, Matheson, VA	*Southern Economic Journal (2008a)*
Commonwealth games	Preuss, H	*European Sport Management Quarterly (2005)*
EURO Cup Soccer	Humpreys, BR & Prokopowicz, S	*International Journal of Sport Management and Marketing (2007)*

Olympics	Madden, J	*Current issues in Tourism (2002)*
	Hotchkiss, J, Moore, R & Zobay, S	*Southern Economic Journal (2003)*
	Preuss, H	*European Sport Management Quarterly (2004)*
	Malfas, M, Houlihan, B & Theodoraki, E	*Municipal Engineer (2004)*
	Madden, J	*Public Finance and Management (2006)*
	Solberg, HA & Preuss, H	*Journal of Sport (2007)*
	Porter, PK & Fletcher, D	*Journal of Sport Management (2008)*
	Kasimati, E & Dawson, P	*Economic Modelling (2009)*
	Giesecke, J & Madden, J	*Economic papers (2011)*
	Li, S, Blake, A, Thomas, R	*Economic Modelling (2013)*
Olympics & Australian Football League	Siegfried, J & Zimbalist, A	*Australian Economic Review (2006)*
Olympics & Soccer World Cup	Whitson, D, Horne, J & Manzenreiter, W	*Sociological Review (2006)*
	Matheson, V	*International Journal of Sport Finance (2009)*
Rugby World Cup	Jones, C	*International Journal of Tourism Research (2001)*
Olympics & Australian Football League	Siegfried, J & Zimbalist, A	*Australian Economic Review (2006)*
Olympics & Soccer World Cup	Whitson, D, Horne, J & Manzenreiter, W	*Sociological Review (2006)*
	Matheson, V	*International Journal of Sport Finance (2009)*
Rugby World Cup	Jones, C	*International Journal of Tourism Research (2001)*
Tour de France	Bull, C & Lovell, J	*Journal of Sport & Tourism (2007)*

TABLE 6. **MAJOR SPORT EVENTS ARTICLES (*cont.*)**

Sport events	Authors	Journals

World Cup Soccer	Baade, RA & Matheson, VA	*Marquette Sports Law Journal (2000b)*
	Szymanski, S	*World Economics (2002)*
	Baade, RA & Matheson, VA	*Regional Studies (2004)*
	Matheson, VA & Baade, RA	*South African Journal of Economics (2004)*
	Horne, JD & Manzenreiter, W	*Review of the Sociology of Sport (2004)*
	Lee, CK & Taylor, T	*Tourism Management (2005)*
	Horne, J & Manzenreiter, W	*Sociological Review (2006)*
	Kim, HJ, Gursoy, D & Lee, S-B	*Tourism Management (2006)*
	Ahlert, G	*Journal of Convention & Event Tourism (2006)*
	Bohlmann, H & Van Heerden, JH	*International Journal of Sport Management and Marketing (2008)*
	Saayman, M & Rossouw, R	*Acta Commercii (2008)*
	Allmers, S & Maennig, W	*Eastern Economic Journal (2009)*
	Fourie, J & Santana-Gallego, M	*Tourism Management (2011)*
	Cornelissen, S	*Tourism and Hospitality Planning and Development (2004)*

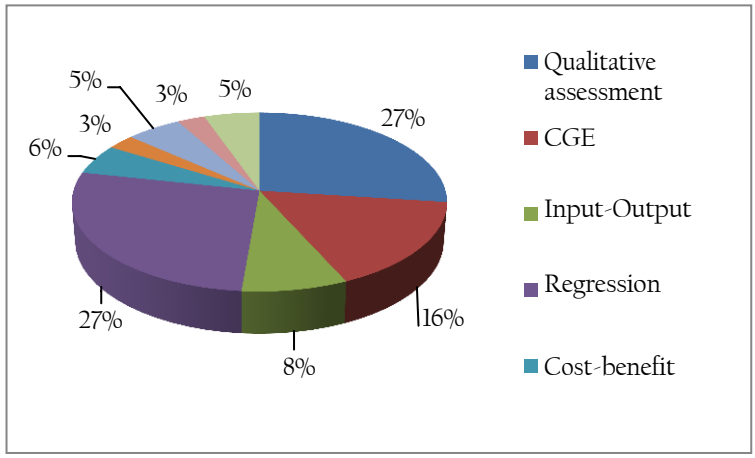


FIGURE 6. **METHODS USED IN ECONOMIC IMPACT ASSESSMENT OF MAJOR SPORT EVENTS**

It is interesting to note that most of the articles were published in the first decade of 2000, with none prior to 2000 and only three articles since 2010. There was clearly a surge in interest in quantifying the impact that these major events exert on the economies that host them. An analysis of the methods used in determining the economic impact is illustrated in

Figure 6 and it is interesting that qualitative assessment was still the dominant method with 27% of the articles that did not report any use of quantitative techniques. Regression analysis shares the top spot with qualitative assessment, mainly due to the contributions by Matheson and Baade. Furthermore, it is evident that CGE and I-O modelling techniques are also quite popular (together they represent 24% of all the methods followed), with limited scope for the

other methods. A closer inspection of the trend in the methods used reveal that CGE and macro modelling are gaining momentum, while I-O methods are falling out of favour when assessing the economic impact of major events.

Analysis of medium-size sport events

Table 7 summarises the 18 published case studies of medium-sized sport events. It is evident that a much wider spectrum of sport events are covered in the research, compared to major sport events that are relatively concentrated on the Olympic Games and the Soccer World Cup. Some of the smaller world cup/championship events (cricket, skiing, ice hockey and judo), are rather classified as medium-sized events due to the nature of the spectator numbers and economic significance.

TABLE 7. **ARTICLES ON MEDIUM-SIZED SPORT EVENTS**

Sport event	Authors	Journals
Badminton, boxing, athletics grand prix, swimming, golf, cricket	Gratton, C, Dobson, N & Shibli, S	*Managing Leisure (2000)*
Badminton, boxing, swimming, show jumping, Judo, indoor climbing, half marathon, snooker	Gratton, S, Shibli, S & Coleman, R	*Sociological Review (2006)*
Baseball	Baade, RA & Matheson, VA	*Journal of Sport Economics (2001)*
Baseball, football, basketball, hockey	Lertwachara, K & Cochran, JJ	*Journal of Sports Economics (2007)*
Cycle - mass participation	Saayman, M, Rossouw, R & Saayman, A	*Africa Insight (2008)*
Grand Prix	Frairley, S, Tyler, BD, Kellett, P & D'Elia, K	*Sport Management Review (2011)*
Golf - British Open	Gelan, A	*Annals of Tourism Research (2003)*
Indy Car	Black, T & Pape, A	*Australian Accountant (1995)*
Marathons	Coleman, R & Ramchandani, G	*International Journal of Sports Marketing & Sponsorship (2010)*
	Kotze, N	*Urban Forum (2006)*
	Saayman, M & Saayman, A	*International Journal of Event and Festival Management (2012)*
Meta-analysis of 13 studies	Hudson, I	*Journal of Sport & Social Issues (2001)*

TABLE 7. **ARTICLES ON MEDIUM-SIZED SPORT EVENTS (*cont.*)**

Sport event	Authors	Journals
Motor cross, Grand Prix	Dwyer, L, Forsyth, P & Spurr, R	*Journal of Travel Research (2006b)*

Winter Games	Murphy, PE & Carmichael, BA	*Journal of Travel Research (1991)*
	Carmichael, B & Murphy, PE	*Festival Management and Event Tourism (1996)*
World Champs - Nordic Ski, Ice Hockey, Judo	Solberg, HA, Andersson, TD & Shibli, S	*Event Management (2002)*
World Champs – skiing	Andersson, T, Rustaf, A & Solberg, H	*Managing Leisure (2004)*
World Cup –Cricket	Saayman, M, Saayman, A & Du Plessis, C	*Journal of Sport & Tourism (2005)*

These smaller world cups/championships, as well as marathons are popular case studies found in literature. With the exception of the two papers on the Winter Games in British Colombia (Canada) by Carmichael and Murphy, all the research was published after 2000. It also appears that different authors are interested in assessing the economic impact of medium-sized events, compared to major events. Dwyer and Matheson and Baade contributed only one article on medium-sized events, while authors, such as Saayman and Saayman, as well as Shibli contributed three joint articles each and Gratton, Andersson and Solberg, and Carmichael and Murphy contributed two joint articles each.

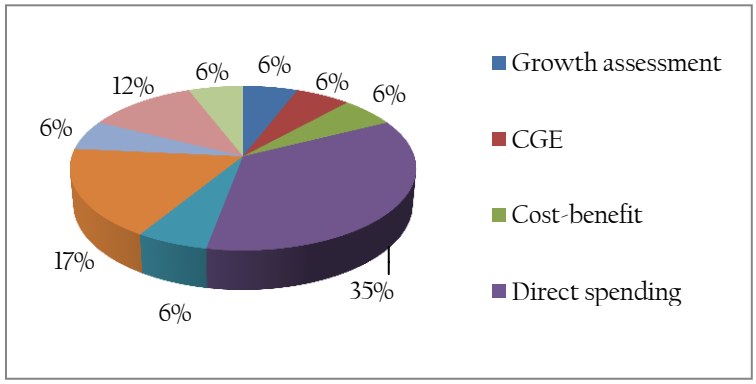


FIGURE 7. **METHODS USED IN ECONOMIC IMPACT ASSESSMENT OF MEDIUM-SIZED SPORT EVENTS**

In terms of the methods used in the assessment of the economic impact, Figure 7 shows that again wide disparities exist between major and medium-sized events. The most popular method used in the case studies is direct incremental spending, with 35% of all articles focusing on determining the extent of additional spending owing to the event. This is followed by qualitative assessment (17%), which remains popular even for medium-sized

sport events. Contrary to the methods used at major events, the use of I-O methods outnumber CGE methods by far, with SAM and I-O multipliers equalling the use of qualitative assessments at 18% of all the studies. CGE modelling and even regression analysis is used in only 6% of the studies respectively indicating that these methods are clearly more suitable for major events.

Analysis of small sport events

Table 8 provides an overview of the 18 case studies published as scholarly articles on the economic impact of small sport events.

TABLE 8. **SMALL SPORT EVENTS ARTICLES**

Sport event	Authors	Journals
11 events	Hodur, NM, Bangsund, DA, Leistritz, FL & Kaatz, J	*Tourism Economics (2006)*
2 Small mass participation events	Nogawa, H, Yamaguchi, Y & Hagi, Y	*Journal of Travel Research (1996)*
Hockey tournament	Yardley, JK, MacDonald, JH & Clarke, BD	*Journal of Park and Recreation Administration (1990)*
Sevens rugby, sailing, cycling, surfing, soccer match	Turco, DM, Swart, K, Bob, U & Moodley, V	*Journal of Sport Tourism (2003)*
National sports championship	Turco, DM & Navarro, R	*Sport Marketing Quarterly (1993)*
Baseball	Dixon, AW, Henry, M, Martinez, JM	*Journal of Issues in Intercollegiate Athletics (2013)*
College football	Baade, RA, Baumann, RW & Matheson, VA	*Journal of Sport Economics (2008b)*
Cooper River Bridge run	Daniels, MJ, Norman, WC & Henry, MS	*Annals of Tourism Research (2004)*
Football	Lee, S, Harris, J & Lyberger, M	*Event Management(2010)*
Indoor bowls, netball	Ryan, C	*Tourism Economics (1998)*
Sailing	Diakomihalis, MN & Lagos, DG	*Tourism Economics (2008)*
Soccer	Cela, A, Kowalski, C & Lankford, S	*World Leisure Journal (2006)*
Swimming	Wilson, R	*Managing Leisure (2006)*
University sport games	Walo, M, Bull, A & Breen, H	*Festival Management and Event Tourism (1996)*
Walk/Run, Tennis, Golf, Soccer, regional champs	Daniels, MJ & Norman, WC Wang, P & Irwin, RL Hefner, FL Lee, M	*Journal of Sport Tourism (2003)* *Sport Marketing Quarterly (1993)* *Journal of Sport & Social Issues (1990)* *Journal of Convention & Event Tourism (2007)*

It is evident that a wide spectrum of sport events are considered in the research, ranging from fun runs to sailing to soccer and hockey matches. It is also often found that more than one event is covered in such an article. Contrary to the research on major and even medium-sized events, the economic impact of small events has delivered a relatively even stream of research over the past 24 years. Again, the authors are quite different, with only Matheson and Baade also contributing to research on small sport events together with major and medium-sized events. The literature is furthermore, not dominated by one or two authors, with only Turco, Daniels and Norman contributing more than one paper on the economic

impact of small sport events.

In terms of the most popular methods followed in the economic impact assessment, Figure 8 indicates that direct incremental spending analysis and regional I-O modelling outscore the other methods with 22% of the articles using these methods respectively. It is evident that I-O modelling remains popular in the economic impact assessment of small events where 39% of all the papers use I-O modelling techniques. I-O modelling and its variants are also gaining momentum in the economic impact assessment of small sport events. The only other noteworthy method is the application of multipliers to direct spending estimates, many of which were taken from theory or similar studies.

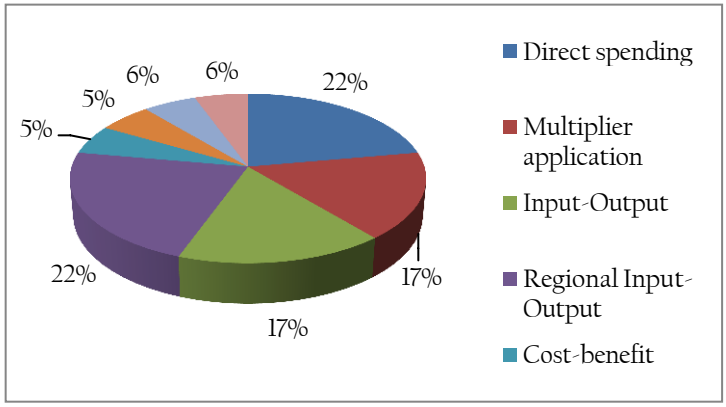


FIGURE 8. **METHODS USED IN ECONOMIC IMPACT ASSESSMENT OF SMALL SPORTS EVENTS**

Figure 8, therefore, illustrates that the methods used in the assessment of the economic impact of small sport events differ markedly from those of major and even medium-sized events. The absence of any qualitative assessment is a noteworthy omission in this line of research and the same can be said for CGE modelling. Regression analysis is also less popular, confirming the notion that methods such as CGE and regression analysis are more suited to larger sport events. Furthermore, I-O analysis remains the dominant method in small sport events and instead of losing steam (as is the case in major sport events); it is gaining momentum as regional I-O models become more readily available. However, contrary to other local impact analyses, there is little evidence that proportional multipliers, based on small-scale (partial) I-O models, are used in the analysis of the impact of small sport events on the local economy.

FINDINGS AND CONCLUSIONS

The purpose of this paper was firstly to provide an overview of the most contentious methodological considerations in measuring the economic impact of sport events, and secondly to analyse the research carried out over the past two decades (since 1990) on the economic impact of such events. Although other reviews are available, this review focused not on major events only, but also on medium and small events. In order to provide a framework for the analysis of the empirical research the classification of sport events were firstly scrutinised, and for the purposes of this review, a classification scheme was adopted based on various building blocks of sport events that take seven different metrics into

account.

Based on the analysis, the following findings are evident. The published research regarding the economic impact of sport events showed a slow start since the 1990s, but most of the published studies were conducted between 2004 and 2008. The review papers also revealed a similar trend, with a significant decline being evident since 2006. The early research mainly focused on small and medium-sized events, with the rapid growth in the first decade of 2000 mainly driven by research on major events. However, the trend appears to be moving back towards smaller events.

Possible reasons for the increasing trend experienced during 2004 to 2008, firstly, include the wider access of researchers with modelling skills (CGE, I-O and regression analysis), to the data on sport events and the greater demand for this type of research. In addition, research was often used as a vehicle to test the claims made by consultants. The declining trend since 2008 might be attributed to there being a wider variety of issues that attract the attention of researchers in terms of sport events and sport tourism in general. Furthermore, the surge in publications during the early years of this century left researchers with the dilemma that it becomes more difficult to make a contribution to this line of research (a requirement for scientific publications), which can still be attained in small event research because these events differ significantly from one another. The decline in case studies available also filtered through to a decline in the number of review papers.

Secondly, the analysis showed that most of the research that was carried out was based on major events and the same applies to the number of available review studies. The surge in research found in the first decade of the 2000s can be attributed mainly to these studies. The major event studies are furthermore dominated by three events, namely the Olympic Games, the FIFA Soccer World Cup and American Football. This is understandable, given that large sums of public money are normally used to finance these events and to provide costly infrastructure in particular.

Thirdly, there has been a clear development in terms of methodology to assess the economic impact of sport events. Some of the methodological papers available are clearly an argument against the misuse of economic impact analyses by consultants. Starting with direct spending estimates and the application of multipliers, modelling methodology developed with the availability of I-O models (and especially regional I-O models), followed by CGE models that address some of the shortcomings of I-O models. Although the modelling methodology has developed substantially, it has exerted a greater impact on major and medium-sized events, with methodological developments for small events not being influenced to the same extent. This is expected, since large-scale models are not suitable for assessing small events.

This research has made several contributions since it is a review that classified sport events in three categories (major, medium and small), based on various building blocks of sport events. Furthermore, the scientific research contributions in each of these categories were analysed. The main methodological issues encountered in economic impact studies of sport events were succinctly summarised in order to guide the reader in the method followed in the analysis of the various economic impact studies conducted for sport events. The researchers identified clear trends in the economic impacts of various sport events and methodologies used, which may assist future researchers. Besides the renewed focus of research to smaller sport events,

major events again fall under scrutiny with Brazil providing a case in point. Communities in Brazil are demonstrating against the use of public funds for the development of infrastructure for the FIFA Soccer World Cup. Given that this is a country where soccer is the national sport, the economic impact is clearly not sufficient to swing the public vote. Future research may develop sufficiently to provide a more comprehensive impact that these events have on supporting communities.

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EDUCATIONAL WORTH OF PHYSICAL EDUCATION AND SPORT PARTICIPATION: A REVIEW

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ABSTRACT

The views of three academics on the educational value of Physical Education (PE) and School Sport (PESS) were assessed. Green explores the supposed effect of PE on current and future participation in sport and concludes that PE teachers cannot attach themselves so deeply to such a weak claim that might be impossible to show. Bailey alleged that the benefits of PESS has been made in such assertive tones that a bystander might think that nothing more can be said. Bailey and Hardman believe that it has not been proven scientifically that PESS contributes to the holistic development of the child. The present article attested the educational worth of PESS. A literature study of mainly primary sources in the field of PE was conducted. The methodology can be typified as qualitative research within the interpretative science paradigm. An educational rationale for the inclusion of PE in curricula is provided by the validation of the Arnoldian dimensions. The arguments offered by Bailey, Hardman and Green are to a great extent rejected. Most of the viewpoints in this

paper are in line with Arnold's rationale for the inclusion of PE in curricula. The inclusion of a subject in curricula relates to the envisaged values concerning the unique content and aims, learning programmes and the actuality and value of the outcomes.

Key words: Physical education; School sport; Educational value of physical education and school sport; Holistic development.

INTRODUCTION, PROBLEM STATEMENT AND METHODOLOGY

In this review article the views of three academics (Ken Green, Richard Bailey and Ken Hardman) on the benefits and/or outcomes of physical education (PE) and school sport will be explored. In the second part of the article a counterplea on their viewpoints is made.

Differences exist between the use of terminology, such as „PE", „sport", „PA", etc. (Bailey *et al*., 2009:2). In this article the definition of Bailey *et al*. (2009:2) will be applicable:

> "… PESS [physical education and school sport] as an inclusive, generic descriptor for those structured, supervised physical activities that take place at school and during the (extended) school day".

Green (2012b:1) explores what he calls the „PE effect", that is, "the *supposed* effect of PE on young people"s current and future participation in sport". Green (2012a) alleges that for the improvement of the engagement in physical activity (PA) by the youth, now and in adulthood, school PE is often depicted as a potentially major, even crucial, agent. He refers to

what he calls the "taken-for-granted assumption", which finds expression among PE teachers and also in government policies internationally (Green, 2012a:2).

According to Green (2012a) the precise nature of the link between physical education and school sport (PESS) and lifelong participation in sport have never been examined explicitly, but mostly treated as an unmistakable truth. In lieu of two vital and obvious reasons any probe into the link between PESS is certain to result in guesswork. Firstly, various variables with multifaceted interrelationships have the potential to effect sport participation, which prevents the isolation of causal factors. Secondly, even if a causal link is found, research methodologies are so flawed that vast difficulty will be experienced in discovering any underlying „reality" (Green, 2012a:2-3).

The prospect of identifying a causal link has been brought into sharper focus by the growth of quantitative cross-sectional research (Green, 2012a). However, Green (2012a:16) refers to Marshall (2009) in his notes who claims that cross-sectional research has failed to deliver credible and convincing, let alone indisputable, evidence for a causal relationship. Other studies, according to Green (2012a), have identified trends in youth sport participation by employing longitudinal data. However, although strong positive links between PESS *may* show a causal relationship, they may not. Any relationship between PESS may, in fact, be „caused" by additional factors, such as age, social class, gender, friends, facilities, family socialisation, etc. Even if it was likely to determine that a strong correlation was a sign of causality, it would not be clear in which direction „causation" was working. For example, it is reasonable to state that advances in youth sport in the 1970s and 80s led rather than stemmed from changes in PE (Green, 2012a).

Some studies (De Knop & Martelaer, 2001, cited in Green, 2012a:5) have sought to enhance quantitative data with qualitative research in order to triangulate the nature of the many kinds of links between PESS. Qualitative research, mainly interviews, is useful to determine the importance of family and friends in youth sport practices, as well as how PE has, or has not, impacted on sport careers (Green, 2012a). Qualitative studies often produce data that has the potential to explain why it may be acceptable to move beyond any correlations to talk in terms of „causal" relationships, although at the level of probability (Green, 2012a).

It is very likely that some young people would simply not take part in any sport without the impact of PE. There is a wealth of subjective evidence from PE teachers, elite players and youth that reinforces this view. Thus, PE may be vital for particular young people for whom it offers the only chance to participate in sport or other forms of physical activity (Green, 2012a). However, Green (2012a:14) believes that:

> "It is unlikely, nevertheless, that there will be one process within PE that explains how school sport influences youngsters" sporting and physical recreation behaviours outside school, let along later in life…"

Green (2012a) further postulates that sport participation is seldom the product of a single cause. As an intervention, PE may work for some but not for others and will work in some settings. For example, youth on the margins who have not been hugely socialised into sport by their families may have some skill and social assets to draw on, but not those youth who have been „locked-out" by virtue of class/ethnic/gender/family socialisation. A far better stake

than PE as a major „cause" of sustainable participation in sport seems to be family socialisation into sport engagement. Therefore, it is wrong for PE specialists to attach themselves so intensely to a claim that appears so weak and may well be shown to be, at worst, unachievable and, at best, impossible to show (Green, 2012a).

In the following section the views of Bailey *et al*. (2009) and Hardman (2010) on PESS will be explored in conjunction with each other. Bailey *et al*. (2009) asks the question: Can PESS provide that which is claimed in its name? There has been a tendency to make undue claims for the benefits of PESS all the way through history. These claims have been made in such assertive tones that an innocent bystander might take them as being definite and that nothing more is to be said about the matter (Bailey *et al*., 2009).

In the review of Bailey *et al*. (2009), the emphasis is on four broad domains: physical, social, affective and cognitive, in other words, what PE specialists commonly regard as the holistic or embodied view on human beings. According to Bailey *et al*. (2009) and Hardman (2010) there is a general understanding that the unique contribution of PESS lies within the physical domain. Hardman (2010:10) alleges that:

> "The physical focus has shifted over time from [a] health-related fitness rationale, through performance-related considerations, to impacts of sedentary behaviours with PA as a public health issue and in the political limelight with lifelong engagement in physical activity as a widely accepted goal, even though evidence of significant benefits from physical education programmes and experiences as a foundation for life-long activity is scarce, limited or not scientifically proven".

The claims made for the social benefits of PESS, in essence, centre on developing children"s abilities to interact positively with others, which can result in widespread gains for themselves, schools and communities. However, it is important to note that central to the

social learning process is the role of the PESS teacher (Bailey *et al*., 2009). Claims on the social benefits have led to questions regarding the nature of the evidence supporting these claims (Bailey *et al*., 2009). There is a need not only to determine the *product* of participation but also the *process* of change. Moreover, more knowledge is needed about how the benefits can be ascribed to a specific initiative, or how other factors influence the effect (Bailey *et al*., 2009). Hardman (2010) is also of the opinion that the mechanisms that lead to improved social behaviour need to be better understood.

Whether any relationship between PA and affective development is causal or casual is difficult to conclude. Additional research investigating *why* and *how* affective development happens within activity-specific contexts is necessary (Bailey *et al*., 2009; Hardman, 2010). Research on the cognitive benefits focus on the development of learning skills and academic performance linked to participation in PESS. A small number of studies seek to discover the mechanisms that might cause cognitive benefits, or ways in which these mechanisms might be initiated by various types of PA and different ways they are presented. Other studies fail to make a distinction between correlation and causation (Bailey *et al*., 2009; Hardman, 2010). The link between PESS and cognitive outcomes needs further research (Bailey *et al*., 2009; Hardman, 2010). According to Bailey *et al*. (2009:16) it can be concluded that:

> "… increased levels of PESS do not interfere with pupil"s achievement in other subjects (although the time available for these subjects is consequently reduced), and in some sub-groups outcomes may be associated with improved academic performance".

In summary, it can be stated that according to the review articles of these three prominent academics, PE as a school subject has no real educational value as it does not contribute towards the holistic development of the child. With this brief background discussion in mind, the aim of this review was to focus on the holistic benefits of school PESS in an attempt to prove its educational worth within educational systems. This research was conducted by means of a literature study of mainly primary, as well as secondary sources in the field of PE and curriculum studies. The methodology applied in this study can thus be typified as qualitative research within the interpretative science paradigm.

COUNTER ARGUMENTS

According to Pope (2011), clout should begin with what a subject means, not with what it claims it does or can do. Pope contends that there will always be rivalry, regardless of whether PESS are considered from within a philosophical, sociological, pedagogical or historical background. The worth of sport, as well as PE, is constantly changing as political, commercial or strategic forces at work make sure that what it means today will not necessarily be the same tomorrow (Pope, 2011).

The aim of schools is to safeguard the growth and development of learners and to prepare them for life. Like all other school subjects, PE shares this aim by focusing more on the socio-motor aspects within an inclusive educational process (Dupont *et al*., 2009). PE that offers a balanced methodology to educate the child holistically is consistent with the educational mission of schools globally (Ennis, 2011), notwithstanding the fact that schools are not only educational settings. Thorburn and MacAllister (2013), on the other hand, believe that there is unease about the educational contribution of PE.

The link between PESS is one of the most long-drawn-out and sensitive topics (Pope, 2011). If anything, the status of PESS have been obscured rather than enlightened by research. The supporting sentiment and the related tension between the PE and sport metonymy is not unique to a specific country and could be applied to many contexts (Pope, 2011). Trudeau and Shephard (2008a) and Haerens *et al*. (2010) allege that fostering lifelong participation in PA is one of the central aims of PE, whereas Ennis (2011) alleges that it is one of the most elusive educational goals of PE. These researchers are correct as current and future participation in PA is but one aim in an array of outcomes related to school PE (Fairclough *et al*., 2002; Penney & Jess, 2004; Ennis, 2011).

The vision of Penney and Jess (2004) concerns the joy of being active; to be able to stay active and to live a „healthy" and „full" life no matter how one views such a life. Their vision specifically relates to a life of *learning*, not just activity, which relates to Ennis"s (2011) viewpoint that the primary focus of PE should be on learning. Through curricula and teaching styles that are deliberate, systematic and seamless, PE is in a position to achieve personal and developmental assets (Weiss, 2011). The PE fraternity should consider the ways and places in which activity and learning opportunities that are applicable to all people in various life

circumstances with differing, diverse and ever changing „activity and health-related learning" needs can be facilitated (Penney & Jess, 2004:277).

According to Ennis (2011:6) the content scope of the PE curriculum should emphasise:

> "… in-depth instruction in a range of physical activities that students [learners] *need* to learn to be physically active; *want* to learn because the activities lead to opportunities in competitive sport and recreation; and *enjoy* learning because the activities are meaningful and relevant in their lives today".

Penney and Jess (2004) believe that *education* cannot be pre-defined, pre-prescribed or simplistically „delivered" in a specific shot; it materialises as a lifelong undertaking where the concern is with a process and not a fixed product. In PE, a shared commitment to develop educated learners who are proficient to critically engage with activity agenda, opportunities and barriers experienced during the course of their lives should develop. An „all encompassing" view of PA should be endorsed by the PE fraternity and be made aware of the varied types of PA that people are involved in for various and wide-ranging reasons (Penney & Jess, 2004).

A holistic educational approach towards the child implies that PE specialists not only advocate daily engagement in moderate to vigorous PA but also the skills, knowledge and perceptions of physical self-worth that cultivate healthy, active lifestyles (Penney & Jess, 2004; Ennis, 2011). For the achievement of health-related goals in PE, transfer of learning needs to take place so that learners will participate in PA beyond the curriculum and the school (Haerens *et al*., 2010). Weiss (2011:55) contends that PE should contribute to *both* motor skill development *and* health outcomes related to participation in PA. Behavioural change can be supported by developmentally appropriate affective and skill-based knowledge presented within an eloquent context (Ennis, 2011).

Le Masurier and Corbin (2006) allege that medicine arose as the renaissance profession in the 20th century because of a sound scientific base. The role of PA in disease prevention and healthy lifestyle promotion is supported by substantial scientific evidence (Le Masurier &

Corbin, 2006). Furthermore, to provide all children with PA experiences that promote PA now and for a lifetime, quality PE signifies to be the best prospect (Siedentop, 2009; Trost & Van der Mars, 2009/10). Yet, PE professionals need to do a better job of recording the evidence on the link between quality PE and present and future PA involvement (Le Masurier & Corbin, 2006; Trudeau & Shephard, 2008a), and distribute it as widely as possible (Bailey & Dismore, 2005).

An educational rationale for the inclusion of PE in school curricula is provided by the justification of the Arnoldian dimensions. Arnold understood the marginalised view on PE and via an intrinsic validation suggesting that PE activities were worthy in and of themselves, he instead confronted the educational legitimacy of subject matter (Brown, 2013). Several present-day PE curricula are either underpinned philosophically or implicitly informed by the Arnoldian notions of education "in, through and about" movement (Brown, 2013:22), which relate to the physical, social, affective and cognitive domains and denotes a holistic approach to teaching PE.

Arnold (cited in Brown, 2013:25), claims that education initiates learners into journeys that are valuable from an „academic" or intellectual and „physical" or practical viewpoint for their own sake. This is an important perspective as it acknowledges that education is more than the pursuit of a narrow idea of knowledge that is being academic or intellectual (Brown, 2013).

Rational enquiry is the main focus of education „about" movement. It is an activity that studies movement form various perspectives, which include anatomical, physiological, sociological or philosophical knowledge of human movement. Arnold claims that education „about" movement can act as an analytical, as well as a critical and evaluative tool (Brown, 2013).

Brown postulates that education „through" movement is perhaps the dimension that is most effortlessly linked with PE. As a means to an end, this dimension uses movement as a way to meet other objectives. Purposes that are not related to any intrinsic values but oriented towards extrinsic values can be achieved in the physical, emotional, cognitive and social domains through participation in carefully chosen and focused PAs (Brown, 2013).

The intrinsic values of PA per se are the main concern of education „in" movement. The participation perspective of the individual is highlighted by this dimension, which can be defined as an „inside" perspective. Consequently, from the perspective of the individual, PAs are worthwhile in and of themselves. This dimension allows the individual to realise him-/herself in unique, pleasing and bodily related situations as a process of understanding their own embodied cognisance, which is a benefit to education. These are personal views that are „good-in-themselves," as well as „good-for-me" (Brown, 2013). Learning „in" movement, therefore, refers to experiential outcomes where learners gain knowledge, understandings and skills as a result of thoughtful participation in PA, such as applying tactics and strategies in a game, assessing the physical capacities and requirements of an activity (Brown & Penney, 2012).

There is a link between participation „in" movement (through the body) and understanding it (through rational knowledge) (Brown & Penney, 2012; Brown, 2013). According to Arnold, movement must be entered into for its own sake where it"s intrinsic worth and qualities can be experienced and its values made obvious. These experiences can move the individual

towards self-actualisation and can expand his or her horizons. On the contrary, in denying an individual this world of bodily action and meaning is to deny the possibility of becoming more completely human (Brown, 2013). Brown (2013:34) states that:

> "Indeed the development of qualities and characteristics of the body in movement contexts that posit a more intrinsic and subjective value of PA, enhances the educational prospects and pedagogical potential of the field, as it acknowledges that different ways of knowing exists in PE and movement.

According to Lu and De Lisio (2009), PE is quite literally education through the physical (bodily movement). A range of well-planned PAs for all children is the trade mark of a quality PE programme, which recognises the importance of developing physically literate individuals capable of sustaining an active and healthy lifestyle. Although PE does not have the sole right on physical literacy, it must embody the overall goal of every PE class. It is necessary to note that the concept of physical literacy is sometimes referenced as "movement

literacy" (Lu & De Lisio, 2009), or movement vocabulary (*my insert*). PE that contributes to the making of the „physically educated" or „physically literate" must go together with enhancements to raise the quality of the teaching and learning processes, as well as PE teacher education and training (Hardman, 2010).

Lu and De Lisio (2009:173) describe another important benefit of PE:

> "… it can promote literacy across the curriculum and elicit an alternative approach to educating children as opposed to the traditional method of teaching each subject in isolation: by integrating instruction from another subject area …".

For example, classes could explore a cultural dance to add to a discussion involving cultural identity and with a little creativity mathematics and science, or any other school subject for that matter, could be integrated into the development of a personal fitness programme. Such an approach whereby the gap between mathematics, science, language, social studies, and others is bridged will assist every child to develop the knowledge, skills and attitudes necessary to lead an active healthy lifestyle (Lu & De Lisio, 2009). A learner-centred „teaching for understanding" approach is more suitable to achieve these outcomes (Fairclough *et al*., 2002). In an effort to accomplish the greater goal of PE, it is vital for teachers to think critically, as the level of success in PE through a developmentally appropriate teaching practice will intrinsically motivate learners and accordingly enhance their enjoyment of PE (Lu & De Lisio, 2009).

Although further research might be necessary to better comprehend the educational offerings of PESS, it clearly has the potential to make a significant contribution to the education and development of children in many ways (Bailey & Dismore, 2005; Trudeau & Shephard, 2005). PE has distinctive features that no other learning or school experience shares (Talbot, 2001; Trudeau & Shephard, 2008a). Hardman (2010) alleges that it is widely accepted, contrary to earlier references to dis-benefits and negative outcomes and mixed research findings messages, that PA can positively influence physical and psycho-social health and hence, is important to all stages in the life-cycle. Over the past 40 years, according to Weiss (2011), extensive research has drawn a firm association between youth engagement in PA and positive behavioural and psycho-social outcomes. Holistically, PESS have an intense and positive effect on the physical, affective, social and cognitive domains (Bailey & Dismore, 2005; Bailey, 2006; Ennis, 2011; Brown, 2013). For the PESS activists, these findings provide backing and comfort (Bailey & Dismore, 2005; Bailey, 2006).

Bailey (2006) alleges that fundamental movement and physical skills are necessary precursors of participation in PA and, therefore, it is suggested that PESS have the potential to make distinctive contributions to the development of these skills. PESS can also support the development of social skills, self-esteem and pro-school attitudes and, in certain circumstances, cognitive development when appropriately presented (Bailey, 2006). According to Stodden *et al*. (2008) a shared notion is that children „naturally" learn fundamental movement skills. The same applies to social skills, self-esteem, pro-school attitudes and cognitive development (Stodden *et al*., 2008). Yet, the claim that these effects will occur automatically is *not* supported by scientific evidence (Bailey, 2006). Whether or not the youth experience these aspects and whether or not they attain the great potential of

PESS will largely depend on the actions and interactions of teachers, parents and coaches (Fairclough *et al*., 2002; Penny & Jess, 2004; Bailey & Dismore, 2005; Bailey, 2006).

In the words of Bailey (2006:397):

> "Contexts that emphasise positive experiences, characterised by enjoyment, diversity, and the engagement of all, and that are managed by committed and trained teachers and coaches, and supportive and informed parents, significantly influence the character of these physical activities and increase the likelihood of realising the potential benefits of participation".

Bailey (2006) claims that it is unclear through which mechanisms active youth become active adults, while Kirk (2005) contends that lifelong participation in PA largely depends on early learning experiences. Indeed, an analysis of retrospective and longitudinal studies indicates that PESS participation in childhood and youth represents an important predictor of later activity (Trudeau & Shephard, 2005; Bailey, 2006; Scheerder *et al*., 2006; Trudeau & Shephard, 2008a). It was also found that exclusion from PESS during childhood and youth can be related to a legacy of inactivity and associated ill-health in the adult years (Bailey, 2006; Scheerder *et al*., 2006). In comparison to educational level or parental socio-economic status, PA participation during adolescence is a better predictor of the involvement of adults in PA (Scheerder *et al*., 2006).

The effects of movement on academic performance and cognitive development are often underestimated (Hendricks, 2004; Fredericks *et al*., 2006). According to Bailey (2006) and Ennis (2011), more research is still required to verify the claims that PESS can enhance academic performance. Yet, for both adults and children contemporary studies do suggest a positive link between intellectual functioning and regular participation in PA (Bailey, 2006). According to Trost and Van der Mars (2009/10:60) it is believed that:

> "Eliminate PE to increase time for reading and math, the theory goes, and achievement will rise. But the evidence says otherwise".

The notion that time in PE lowers test scores has been boosted by the *No Child Left Behind* (NCLB) in the US. The NCLB created a situation in which the so-called practical subjects like PE, Music and Arts were viewed as secondary to the so-called academic subjects, because it linked federal funding to schools" yearly progress in reading and mathematics (Trost & Van der Mars, 2009/10).

The question is whether the idea of reducing PE time to improve academic performance is sound. Evidence reveals the opposite. Academic performance remained unaffected by

reductions in time allotted to PE (Brown *et al*., 2008; Budde *et al*., 2008, Ericsson, 2008; Siedentop, 2009). On the contrary, studies indicate that by increasing PE time resulted in improvements in academic performance (Bailey, 2006; Trudeau & Shephard, 2008b; Trost & Van der Mars, 2009/10; Hardman, 2010). There is a growing body of research indicating that purposeful movement expand brain function and learning, which makes movement a prerequisite for learning readiness (Krog & Krüger, 2011). Within the scope of this review, the lack of space does not allow for an elaboration on brain functions and learning.

Hendricks (2004) found that the Grade 1 learners in the experimental group, compared to the other groups, showed a greater improvement in reading and mathematical skills after an eight week intervention programme (a developmental movement programme), that was presented for 20 minutes a day. Additionally, the classroom teachers reported that these learners were more alert and quicker in their responses after the exercise period. Certain learning experiences of Grade 1 learners will be improved when movement programmes target those systems that are crucial to a child‟s ability to learn (Fredericks *et al*., 2006; Ericsson, 2008; Trudeau & Shephard, 2008b).

In the study of Pienaar *et al*. (2011) among 40 four- to six-year old children, they found that a Kinderkinetics programme significantly improved body awareness, gross and fine motor skills, coordination, balance, bilateral integration, locomotor skills and spatial awareness, as well as selective cognitive concepts and attentive and observational skills. Du Toit *et al*. (2011) found a positive relationship between physical fitness components and academic achievement in 212 South African primary school children aged 9- to 12-years. More significant correlations were found among girls compared to boys, and among older boys and girls.

Certain limitations exist in research on the link between PE and academic performance (Trost & Van der Mars, 2009/10). Firstly, there is a lack of research piloted in secondary schools. Secondly, the amount of time spent in PE is used as the key independent variable in most studies, without considering the *quality* of instruction. Lastly, these studies often lack what is called *ecological validity* (transferability of findings). For example, if a study was conducted in a laboratory, the research finding may not transfer to school PE settings. The same applies if the type, amount or intensity of PA in the study differed significantly from a typical school PE lesson (Trost & Van der Mars, 2009/10).

Perhaps, most importantly, too little is known about the PE effect on academic performance among learners at a high risk for obesity, as well as children from low socio-economic milieus and those from black, Latino, American Indian and Pacific Islander families (Trost & Van der Mars, 2009/10). It is important to remember that from kindergarten to secondary school, PE is the only PA that most children are exposed to, which is particularly true for PESS in deprived areas (Kirk, 2005; Dagkas & Stathi, 2007; Trudeau & Shephard, 2008a). Dagkas and Stathi (2007) claim that participation prospects for learners from lower socio-economic ranks are limited in comparison to their counterparts from higher socio-economic ranks. Schools in economically deprived areas need to provide better and a wider provision of structured PA to compensate for lower participation levels in PA outside school (Dagkas & Stathi, 2007; Stodden *et al*., 2008). The future economic health of societies depends on a strong academic education. However, a delicate balance exists between a nation‟s economics and public health (Trost & Van der Mars, 2009/10). Trost and Van der Mars (2009/10:63) explain:

> "It is indefensible to support an education system based primarily on promoting economic productivity in people who will likely be too unhealthy to enjoy whatever benefits come their way".

The longitudinal study of Roebers *et al*. (2013) reveals a substantial association between fine motor skills and intelligence in pre-school and kindergarten children. They propose that executive functioning (EF) (information processing speed, attention and/or the mastery of speed-accuracy trade-offs), in both fine motor tasks and intelligent tests are shared devices. It was surprising how strong the link between EF and academic achievement was (Roebers *et al*., 2013). EF, as a "common domain-general factor", underlies the motor-cognitive achievement link and explicitly highlights mathematical achievement (Roebers *et al*., 2013:11). Their study established that EF is an essential factor for explaining (a) the motor-cognitive link and (b) the predictive influence of fine motor skills for early academic success (Roebers *et al*., 2013).

Those in power who shape the education and future of children can no longer overlook the link between PA and academics, as well as the severe negative health concerns of reducing PE (Trost & Van der Mars, 2009/10). Both academic achievement and PA are independent determinants of a child‟s health (Trudeau & Shephard, 2008b). Future generations of healthy people can only be shaped by PA and, therefore, PE has a legitimate claim to a part of the school day (Trost & Van der Mars, 2009/10).

In some respects, owing to the distinctive contexts of PESS, the holistic effect is unique. Therefore, for those who accept the value of PESS, there is a duty to act as activists for its place as an indispensable feature of the education of all children. They must not just argue for the inclusion of PESS within the curriculum and for sufficient time on the school time table. They also need to stress the meaning of the *quality* of programmes and share information on the benefits of PESS among administrators, parents and policy makers (Bailey, 2006). Key components of quality PE programmes are learning opportunities, and meaningful and appropriate instruction (Le Masurier & Corbin, 2006).

Le Masurier and Corbin (2006) are of the opinion that PE, taught by specialists in PE, will increase the PA levels of youths. Just as any other school subject, quality PE provides learners with the required skills needed in the real world. Self-management skills that help young people take on healthy living practices and manage their day-to-day activities is among the most important skills (Trudeau & Shephard, 2005; Le Masurier & Corbin, 2006; Siedentop, 2009).

The context and structure of quality PE, which can vary extensively between countries, to a large degree, governs learners‟ attitude towards PE (Kjønniksen *et al*., 2009). During the secondary school years a definite decline in participation levels with an increase in age exists in both genders, which may cause a related decrease in a positive attitude towards PE. Amid boys and girls, the reasons for the changes in attitude towards PE may also differ (Kimball *et al*., 2009; Kjønniksen *et al*., 2009; Pannekoek *et al*., 2013).

When it comes to participation in PA, boys have more positive attitudes than girls, which may reveal the observation that PE curricula favour boys more than girls. It could also be that specific cultural gender roles might affect the participation levels of girls more negatively

than those of boys (Kirk, 2005; Kimball *et al*., 2009; Kjønniksen *et al*., 2009; Haerens *et al*., 2010). Kjønniksen and co-workers found that at the ages of 13 to 16 years both boys and girls had a positive attitude towards PE after which it declined for both genders (Trudeau & Shephard, 2005; Kjønniksen *et al*., 2009). During adolescence, attitude towards PE was moderately related to participation in sport. Although the proportion of explained variance

was very small, both positive attitudes towards PESS significantly predicted PA in adulthood (Kjønniksen *et al*., 2009).

Many learners receive their first movement experiences in regular PA in PE where they develop attitudes towards the subject. Participation in activities outside of school may be influenced by these experiences and result in more positive attitudes towards PA. Thus, in upholding a physically active lifestyle outside school, positive attitudes shaped in PE may play a vital role (Kjønniksen *et al*., 2009). Conversely, Kjønniksen *et al*. (2009) alleges that the opposite can also be true. Adolescents may transfer skills evolving from participation in sport into PE, which may account for some of the positive and consistent patterns of attitude towards PE.

PE curricula that only communicate the message that it is just relevant to competent movers interested in competitive sport are in danger. Many lower skilled girls (and boys – *my insertion*) might feel uncomfortable participating in team-based curricula and the patriarchal practice of an overemphasis on competition might create such an environment (Kimball *et al*., 2009). Haerens *et al*. (2010) claims that PE teachers need to increase their efforts to enhance girls‟ self-determined motivation. Haerens *et al*. (2010) found that the motivational profiles of high school learners did correlate with their PA levels in early adulthood and, therefore, the profiles of these learners are likely to relate to their future PA patterns. When learners find enjoyment and meaning in their learning, they build a positive attitude towards PA and will persist in these practices throughout their life time (Dupont *et al*., 2009).

There is a tendency among people to think that PE is PA and that teaching PE is nothing more than just presenting a cluster of PAs. PE, from a conceptual perspective, is not just any PA or sport. An individual will need the indispensable foundation as fostered through a quality PE programme in order to maintain an active healthy lifestyle (Lu & De Lisio, 2009). A limited and indefensible idea of the role of PE is the extensive practice in PE curricula to offer experiences, which only serve to strengthen achievement-orientated competition sport (Hardman, 2010). If the educational potential of school sport rather than its competitive side was emphasised, it would appeal to more learners (Trudeau & Shephard, 2008b).

A crucial site for learners to develop positive feelings of physical self-worth and perceived competence, associated with motor skills and fitness, is PE. Physical self-worth and perceived competence can lead to a more positive attitude towards PA and learners who perceive themselves to be skilled will participate in more diverse activities. For continued participation and enjoyment in PA these perceptions appear essential. PE provides environments for children to judge self-competence in skill, sport and PA in nurturing mastery-oriented environments. Positive, effective beliefs about ability and competence appear to influence effort and decisions to select PA over sedentary quests and are more likely to lead to long-term commitment to PA (Wallhead & Buckworth, 2004; Bailey, 2006; Stodden *et al*., 2008; Trudeau & Shephard, 2008a; Dupont *et al*., 2009; Ennis, 2011; Weiss, 2011).

Jaakkola *et al*. (2012) allege that although the importance of PE has been recognised, only a few longitudinal studies analysed the role of perceptions of school PE in the development of PA patterns in adolescence. How these variables are related may be better understood by investigating the motivational factors over long periods of time (Jaakkola *et al*., 2012;

Pannekoek *et al*., 2013). The purpose of the study of Jaakkola *et al*. (2012) was to analyse the motivational experiences of Grade 9 learners in PE to determine their self-reported PA behaviours. More specifically, they wanted "to investigate the role of task- and ego-involving motivational climates measured in Grade 7, perceived competence measured at Grade 7 and intrinsic and extrinsic motivations measured at Grade 8 as antecedents of self-reported PA measured at Grade 9" (Jaakkola *et al*., 2012:136). They hypothesised that self-reported PA would be positively and successively predicted by a perception of task-involving climate, perceived competence and self-determined motivation (Dupont *et al*., 2009; Jaakkola *et al*., 2012). Perceptions of autonomy, competence and relatedness are determined by social factors, which in turn determine the level of self-determination (Dupont *et al*., 2009).

Jaakkola *et al*. (2012) claims that by creating a task-involving motivational climate, for example, by emphasising learners‟ effort, progress and learning, PE teachers are in a position where they can facilitate learners‟ self-reported PA. The learners‟ need for competence can be facilitated in these climates, which in turn fuels intrinsic motivation and eventually leads to the increase of self-reported PA. Studies have shown that qualified PE teachers can positively contribute to a number of PA-related outcomes by creating a task-involving climate (Kirk, 2005; Jaakkola *et al*., 2012). Individuals will be in a position to access and engage actively in the physical culture of society when physical competencies are developed in the early years. Jaakkola *et al*. (2012) conclude that the motivational experiences the adolescents had explained 18% of their self-reported PA at Grade 9, which is not extraordinarily high, but indicates that PE has a role to play in motivating learners towards PA. The results suggest that for adolescents‟ perceived competence, PE motivation and PA patterns, the perception of task-involving motivational climate is important (Jaakkola *et al*., 2012). According to Dupont *et al*. (2009:37) autonomy and competence "positively predicted intrinsic motivation to know, intrinsic motivation towards accomplishment, intrinsic motivation to experience stimulation and identified regulation".

Stodden *et al*. (2008) contends that the idea of actual motor competence is overlooked in theoretical modes on the determinants of PA. They remind us that perceptions of competence are contextually based. The notion of task difficulty is not just dependent on self-perceptions of ability, but rather linked to actual motor competence (Stodden *et al*., 2008). If a child does not have the prerequisite skills to be successful at a task, the task at hand becomes difficult. In understanding why individuals choose to be either active or inactive, Stodden *et al*. (2008) believe that developing motor competence or skilfulness is vital. Hendricks (2004) alleges that if children do not gain confidence in their motor competence, problems may occur in the other domains of being human (cognitive, emotional and social domains).

Dupont *et al*. (2009) asserts that a positive effect exists between integrative negotiation (teacher-student negotiations) and learners‟ self-determined motivation towards PE, and that the learner‟s perception of his or her autonomy is either completely or partially facilitated by this influence (Weiss, 2011). Dupont *et al*. (2009:40) elaborates:

> "More precisely, the perception of having learned during PE classes is positively predicted by intrinsic motivation to know, by identified regulation and by perceived

> enjoyment, while perceived enjoyment is positively influenced by intrinsic motivation to experience stimulation, external regulation and amotivation".

Four key points of intervention for youth participation in PA are (Weiss, 2011:58):

> "… to develop *competence*, provide opportunity for *autonomy* or choice, promote positive adult and peer *relationships* and maximise *enjoyment* and minimise anxiety".

The acronym CARE can be created if we take the first letters of these four key areas, namely competence, autonomy, relationships and enjoyment, which provides an appropriate label for PE teachers to increase PA and positive health outcomes (Weiss, 2011).

Stodden *et al*. (2008) contend that a causal mechanism, partially responsible for the health-risk behaviour of PA, can be found in the degree of motor skill competence. Moreover, it is critical to focus on the constructive or destructive developmental routes of PA and the precursor-ensuing mechanisms of why people choose to be either active or inactive. These relations are rooted in and swayed by other contextual factors (environment, family, peers, socio-economic status, culture, nutrition, self-efficacy, etc.), that affect the likelihood to be active (Stodden *et al*., 2008). Two additional questions need to be answered:

> "Will the strengths of these relationships continue to increase over the lifespan (i.e., throughout adolescence and adulthood)? Or, will other factors change the nature of these relationships as we age"? (Stodden *et al*., 2008:303)

CONCLUDING COMMENTS

The arguments surrounding PESS offered by Bailey *et al*. (2009), Hardman (2010) and Green (2012) are to a great extent rejected. That various variables with multifaceted inter-relationships impact on sport participation as stated by Green (2012) cannot be disputed and, therefore, the link between PE and sport participation, now and in future, will always be elusive. Green (2012a:14) further claims that family socialisation is a far better stake than PE as a major „cause" of sustainable participation in sport. The author is in agreement with Green, but wishes to add that collaboration between parents and schools in this regard becomes of utmost importance to ensure future healthy lifestyles for the majority of societies around the world.

According to Bailey *et al*. (2009) the role of the PE teachers is central in the social learning process. Why would they want to state this in a negative sense? By means of a holistic approach to teaching PE, quality programmes driven by properly trained and qualified, enthusiastic teachers, it can materialise. No development will happen automatically. Thorburn and MacAllister (2013) refer to unease about the education contribution of PE. On this note the author would like to encourage the reader to study the rest of the discussion provided below.

In line with most of the viewpoints discussed in the previous section and the Arnoldian dimensions in Brown (2013) an educational rationale for the inclusion of PE in school curricula was presented by Van Deventer in 2002 in a keynote address at the 12th Commonwealth International Sport Conference. This view on quality PE (Van Deventer 2002) will be briefly discussed in the sections that follow.

Physical education

The rationale for any subject to be included in the school curriculum relates to the envisaged values associated with broad, unique content and aims (What), learning programmes (How), and the actuality and merit of the outcomes (Why). *What* should be taught relates to the *motor* and *physical domains* that are unique to PE, while the *affective*, *social* and *cognitive domains* are essential to ensure an educational and holistic approach to learning. The word „physical" in PE implies *active participation*. The goals are:

- to discover, master and refine performance of *fundamental* (natural/maturation) *movements* and a wide variety of *specific movement skills* and *movement forms* [learn TO move];
- to stimulate growth and develop the body through participation in physical activities.

The word „education" in PE implies *guiding* learners through a formative process where the goals are:

- to gain knowledge and understanding (*cognitive*) of the body and physical activity [learn ABOUT movement];
- to develop positive behaviour by gaining personal meaning (*affective*: body image, self-image, enjoyment, lifestyle); and
- to develop social meaning (*social*: coping with co-operation, collaboration, competition) based on sound social and cultural values [learn THROUGH participation].

The *How* of PE concerns effective and formative learning programmes geared to educate the child for an active and healthy lifestyle. The programme should be:

- child-centred (general needs, abilities, interests, aspirations);
- learner paced; and
- content-based with a knowledge structure, domain specific and process orientated.

Teaching-learning strategies with a *holistic approach* and an emphasis on skills, knowledge and attitudes are required to achieve these programme goals (Van Deventer, 2002). The teaching learning experiences should take place within the existing and developing *context of the movement culture* of a society (macro-level) and a particular community (micro-level) as it exists outside the school (DNE, 1993; Crum, 1998; ICSSPE, 1999a).

Why PE should be taught relates to the specific objectives which are based on the various domains (DNE, 1993; ICSSPE 1999b).

Quality requirements

„Quality" signifies „high status" and a „high grade of excellence". Being awarded "status" in the education system is often based on the acceptability of the values associated with broad, unique content and aims, effective and formative programmes and the actuality and merit of the outcomes envisaged (What? How? Why?) (Van Deventer, 2002). „Excellence" is dependent on the expertise available (trained specialists) to operate the system, adequate time and frequency (scheduling) and the availability of the necessary facilities (Who? When? Where?). The finding of the *Worldwide Audit* revealed that neither „status" nor „excellence" is

a feature of PE programmes.

Quality PE would thus, it seems, depend very much on what, how, why, when and where. To my thinking, what is being taught, how, why, when and by whom it will be taught, will contribute more to the quality of the educational process than where. Quality PE is dependent on qualified PE specialists, rather than on equipment and facilities (Burnett, 2000; Solomons, 2001). Talbot (2001:47) also believes that "human resources are more effective than physical ones". Crum (1998) alleges that quality PE can only be guaranteed by structuring it as a teaching-learning enterprise as in other school subjects. Just as languages introduce learners to a language culture, PE can qualify learners for an emancipated, satisfying and lifelong participation in a movement culture (Van Deventer, 2002:16).

> "Quality PE is not teaching, [it] is not rocket science; it‟s much harder" (Ennis, 2011:16).

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LEISURE NEGOTIATION STRATEGIES SCALE: A STUDY OF VALIDITY AND RELIABILITY FOR UNIVERSITY STUDENTS

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ABSTRACT

The aim of this study was to develop a Turkish version of the "Leisure Negotiation Strategies Scale" for university students and to examine its validity and reliability. The Leisure Negotiation Strategies Scale contains 31 items, which are expressed on a 5-point Likert scale. The scale was tested in two separate samples comprising a total of 810 Turkish students. The first group (n=400) was used to test data using exploratory factor analysis, and the second group (n=410) was used to test data using confirmatory factor analysis. Explanatory factor analysis produced a 6-factor solution with the sub-dimensions time-management strategies, skill-acquisition strategies, interpersonal relations, intra-personal validation strategies, physical fitness strategies and financial management. Confirmatory factor analysis confirmed this 6-factor solution (first order confirmatory factor analysis, GFI=0.85, AGFI=0.82, NFI=0.87, TLI=0.90, CFI=0.91, RMSEA=0.072, SRMR=0.074; second order confirmatory factor analysis, GFI=0.85, AGFI=0.82, NFI=0.87, TLI=0.90, CFI=0.91, RMSEA=0.072 and SRMR=0.074). Cronbach's alpha coefficient values ranged from 0.70 to 0.77 in the 6 sub-dimensions. Finally, evidence of test-retest reliability of scale scores was supported, based on responses from 100 students. These results demonstrate that this Turkish version of the scale is a valid and reliable instrument for university students.

Key words: Leisure constraints; Coping; Scale; Factor analysis; Turkish students.

INTRODUCTION

Many studies conducted in different disciplines have stated that individuals should participate regularly in physical activities in their leisure time for a balanced life. The World Health Organisation has reported that, for a variety of reasons, insufficient participation in physical activities is one of the risk factors for global mortality causing an estimated 3.2 million deaths globally in a year (World Health Organization, 2014). One of the main aims of leisure studies is to understand how people spend their leisure time. For this reason, knowing both factors that lead people to leisure activities and those that prevent people from participating in leisure activities would facilitate understanding of why people participate in these activities, such as: motivational factors; life satisfaction (Huang & Carleton, 2003); and leisure satisfaction (Jackson, 1991).

One of the most important topics considered in studies of leisure is constraint (Jackson & Scott, 1999). A constraint, in general, is an abstract or concrete structure consisting of one or more reasons that prevent the occurrence of certain behaviour (Jackson, 1988). Leisure constraints could be seen as an accumulation of factors that prevent the individual from participating in leisure activities, decrease the number of repetitions, break the motivation to participate in activities, cause loss of time, undermine the advantages of leisure services and decrease the degree of satisfaction expected from these activities (Jackson & Henderson, 1995; Jackson & Scott, 1999).

Crawford and Godbey (1987) have identified three groups of constraints. These are internal constraints, which include individuals‟ psychological condition and attitudes; interpersonal

constraints, which stem from the conflict of differing characteristic features and structural constraints, which occur as a result of the inconsistency between available recreational activities and fields and the way in which people wish to spend their leisure time. Crawford *et al*. (1991) sequenced the constraints people experience hierarchically. According to these authors, internal factors are the strongest determinants of behaviour, and external factors have a weaker impact. The level of participation and non-participation results from the relationships between these factors. Oh *et al*. (2001) conducted a study on this topic that also supports this view. Again many studies have demonstrated that the strongest factor limiting the participation of people in leisure activities is the constraint that stems from peoples‟ own minds (Frederick & Shaw; 1995; Henderson *et al*., 1995; Carroll & Alexandris, 1997; Hubbard & Mannell, 2001; Alexandris *et al*., 2002; Wood, 2011).

According to Jackson *et al*. (1993), constraints do not prevent people from participating. Leisure participation relies heavily on the ability of the individual to manage their daily routine while struggling with many factors (Crawford *et al*., 1991; Scott, 1991). Many people can negotiate the constraints or struggle with them. Within the scope of this proposition of Jackson *et al*. (1993), Jackson and Rucks (1995) examined the strategies for negotiating the constraints of secondary and high school students. They found that the most common strategy used by students for negotiating the constraints is time management ability. Other popular strategies mentioned were gaining new skills for participation, inter-personal relations with people with whom they participate and physical convenience, as well as financial strategies whether occupational or other income sources are provided to enable participation in activities that have some cost.

Subsequently, Hubbard and Mannell (2001) examined how to negotiate leisure constraints in a recreation company environment. They developed the *Leisure Negotiation Strategies Scale*, which is based on the negotiation strategies defined by Jackson and Rucks (1995), in order to question workers in recreation-related companies. The negotiation strategies in this scale were sequenced as skills acquisition, inter-personal coordination and financial resources. It was found that constraints decreased the level of participation in recreational activities and also stimulated greater use of negotiation sources. The results of this study supported the constraint negotiation propositions developed by Jackson *et al*. (1993) and a theoretical model that explains the role of motivation in negotiation. In subsequent years, this scale has been modified by Elkins (2004) to address recreational campus sport and its validity was verified by Beggs *et al*. (2005).

The university years are accepted as a time that has fundamental effects on the lives of individuals. The ability of university students to participate in recreational activities during their leisure time depends on the opportunities available. Many university students cannot

participate in these activities, or cannot participate at the desired level, because of constraints, such as „facility/service and transportation‟, „social environment and lack of knowledge‟, „individual psychology‟, „lack of friends‟, „time‟ and „lack of interest‟. However, they would be willing to participate if campus life offers them sport programmes and other activities. It has been observed that many students develop strategies to be able to negotiate with these constraints. This concept is very important and would serve as a valuable tool in the lives of individuals (Henderson & Bialeschki, 1993; Samdahl & Jekubovich, 1997; Little, 2000).

PURPOSE OF THE RESEARCH

While many studies related to leisure constraints have been conducted in Turkey, where the concept of leisure negotiation has recently been a popular topic, there is a shortage of studies related to the concept of negotiation strategies. This need motivated the present study. In addition, it is believed that by establishing which strategies university students adopt to negotiate the constraints and participate in recreational sport activities, would serve as a contribution to the leisure literature. Within this scope, the aim of this study was to test the reliability and validity of the Leisure Negotiation Strategies Scale for Turkish university students, who participate in recreational campus sport.

METHODOLOGY

Participants

The population for this study consisted of 4129 university students, who were studying at the 1st year level in 14 faculties, 5 schools, 5 vocational schools and 1 conservatory, and were enrolled in elective physical education courses in the 2011-2012 academic year. The sport presented was basketball, mountaineering, football, body building, folk dancing, table tennis, tennis, volleyball and swimming. Two separate samples were selected from this population. The first group comprised 400 students (mean age=20 years; SD=2; female=105; male=295), and the second group comprised 410 students (mean age=20 years; SD=2; female=126; male=284). An exploratory factor analysis (EFA) was conducted on the data of the first group, and a confirmatory factor analysis (CFA) was conducted on the data of the second group. Another 100 students were then recruited to examine the test-retest reliability of scale scores.

Measurements

Leisure Negotiation Strategies Scale (LNSS)

This study used the negotiation strategies developed by Jackson and Rucks (1995) and the quantitative measures of negotiation established by Hubbard and Mannell (2001) (overall Cronbach‟s alpha reliability of 0.72), to examine negotiation strategies in a campus recreational sport setting. Elkins (2004) modified the negotiation instrument developed by Hubbard and Mannell (2001), and leisure negotiation was operationalized using Elkins‟s (2004) Negotiation Strategies Scale. This scale was further validated by Beggs *et al*. (2005). *LNSS* consists of 31 ways that relate to 6 basic negotiation strategies: time management; skill acquisition; inter-personal relations; intra-personal validation; physical fitness; and financial management (Table 1). Cronbach‟s alpha coefficients indicated strong measures of reliability

with an overall internal consistency of 0.89 and negotiation strategy subscales ranging between 0.85 and 0.91.

TABLE 1. **LEISURE NEGOTIATION STRATEGIES SCALE**

Scales and subscales
Time-management strategies
1. I cut short my activity session
2. I get up earlier or stay up later
3. I try to be better organised
4. I cut short time for work, school, and family

5. I schedule my classes to allow time for me to participate
6. I cut short time for other leisure activities
7. I've altered the time that I would normally participate
8. I choose to participate at times the facilities are not crowded

Skill-acquisition strategies

9. I utilise campus resources to learn what activities are offered
10. I try to learn new skills/activities
11. If I'm not skilled, I swallow my pride and do the best I can
12. If I'm not skilled, I ask for help with the activity
13. I practice so I am better at the activity

Inter-personal relations strategies

14. I participate in activities with people of the same gender
15. I try to find people to participate with
16. I try to find someone to give me a ride
17. I encourage my friends to participate with me
18. I adjust my activity choice based on what my friends want to do
19. I'm willing to participate with people that I don't know

Intra-personal validation strategies

20. I participate in activities that I am good at
21. I purposely participate in activities that are not competitive
22. I try to select activities where I can avoid conflict with others

Physical fitness strategies

23. I try to eat right so I feel like participating
24. I try to sleep more so I feel like participating
25. I try to improve my physical fitness so I can participate
26. I wear proper protective/safety equipment to prevent injury

Financial management

27. I try to budget my money so I can participate
28. I improvise with the equipment/clothes that I have
29. I got a job so I would have money to help me participate
30. I borrow equipment/clothes from others so I can participate
31. I participate in less expensive activities

Source: Beggs *et al.* (2005:147-148)

„Time management" strategies refer to issues related to better planning and organisation of time. „Skill acquisition" comprises strategies that included learning and practising new skills. Inter-personal relations reflect participation strategies that involve interactions with other people. „Intra-personal validation" is the degree to which individuals change their leisure aspirations. „Physical fitness" strategies refer to issues related to the improvement of fitness and prevention of injury. Finally, „financial management" strategies involve improvement of financial status in order to participate in leisure activities. The items were measured using a 5-point Likert scale based on the frequency of use of each negotiation strategy (1=never to 5=very often) (Beggs *et al*., 2005).

Language adaptation process

The language adaptation process was done in 5 steps as adapted from Beaton *et al.* (2000). These steps consisted of 1-Translation, 2-Synthesis, 3-Back translation, 4-Expert committee review, and 5-Pre-testing. The translation of the *LNSS* from English to Turkish was carried out by 2 Turkish academics working in the recreation area and having a university education

in the English language. These academics had entered language examinations conducted by the Higher Education Council of Turkey and proved to have adequate English language skills. For the synthesis step, the assessment of the translation was performed by 3 different academics from the recreation area and 2 specialists in English linguistics.

After the necessary adjustments, the Turkish translation was translated back into English by 3 different linguistic experts, none of whom had participated in the initial phase of the study. The purpose of the back-translation phase was to check for discrepancies between content and meaning of the original version of the scale and the translated version. After the back-translation an expert committee consisting of 2 different academics from the recreation area and a linguistic expert examined the back-translation and the original version of the scale. For the last step, which is the pre-testing of the scale, a parallel validity test was conducted.

In order to test whether the original English and Turkish forms had parallel test validity, 18 individuals who were academics and graduate students in recreation and sport science completed both forms. In order to eliminate the possible learning effect, the original English and Turkish forms were given respectively with an interval of 2 weeks. There was a significant correlation between the scores obtained from the 2 forms ($r=0.92$, $p<0.05$). Furthermore, a paired t-test was applied in order to examine whether the mean score on the Turkish scale differed from that on the original scale. The results showed that the Turkish version was an adequate alternative to the original form ($p>0.05$).

Procedure

The administration of the schools granted permission to perform the research and students were informed of the purpose of the study and their rights as participants. The scale was administered during elective physical education courses with permission from the lecturer. Prior to the administration of the scale, the participants were informed about the scales and the importance of answering questions honestly was emphasised. The scale took approximately 10 minutes to complete.

Statistical analysis

Validity

Exploratory Factor Analysis (EFA): Responses obtained from the first sample were examined by the EFA using the SPSS version 18.5. EFA aims to discover a factor or factors on the basis of the inter-variable relations (Tabachnick & Fidell, 2001). A principal components analysis was performed using Kaiser‟s criterion (eigenvalue >1), followed by a varimax rotation. It was accepted as the criteria that factor loads of the clauses should be at least 0.35 (Field, 2000; Hair *et al*., 2006), and the difference between the item factor loads included in the 2 factors should be at least 0.10 (Tabachnick & Fidell, 2001). The internal consistency of the overall scale and subscales were measured by Cronbach‟s alpha coefficient.

Confirmatory Factor Analysis: The Confirmatory factor analysis (CFA) was performed on the data from the second sample, using LISREL 8.7 (Jöreskog & Sörbom, 2004), and the model parameters were estimated using maximum likelihood estimation (Tezbaşaran, 1997). The purpose of the CFA is not to identify the number of factors, but to confirm the factor structure of the scale. Consequently, CFA is more of a theory-testing procedure, in which variables can be specified to be loaded onto certain factors and the number of factors is fixed

in advance. Whether the measurement model identified in the first sample had an acceptable goodness of fit was evaluated using the following commonly used goodness of fit statistics: Root Mean Square Error of Approximation (RMSEA), Goodness of Fit Index (GFI), Standardised Root Mean Square Residual (SRMR), Adjusted Goodness of Fit Index (AGFI), Normal Fix Index (NFI), Tucker Lewis Index (TLI) and Comparative Fit Index (CFI) (Kline, 2005).

Reliability

Additionally, the test-retest reliability of scale scores was examined in data from 100 students from the university, who completed the *LNSS* twice with an interval of 2 weeks between tests.

RESULTS

Content validity

In order to test whether the original English form and Turkish form had parallel test validity, 18 individuals who are academics and graduate students in recreation and sport sciences were administered both forms. The possible learning effect was eliminated by applying the original English and Turkish forms respectively with an interval of 2 weeks. The correlation between the scores obtained from the 2 forms was significant (r=0.92, $p<0.05$). Also, a paired t-test was used to examine whether there was a difference between the mean scores on the Turkish scale and the original English scale. The results showed that the Turkish version was an adequate alternative to the original form ($p<0.05$). This result supports the conclusion that the Turkish form could be used in place of the original form.

Validity

Exploratory Factor Analysis

First, analyses of sampling adequacy were conducted on the 31 items of the *LNSS* to determine whether it was suitable for factor analysis. Bartlett‟s test of sphericity indicated a chi-square value of 3500.75 ($p<0.001$), and the Kaiser-Meyer-Olkin measure of sampling adequacy indicated a value of 0.811. When a basic scree-plot test and eigenvalue >1.0 criteria were used, 6 factors were generated from the *LNSS*. It was accepted as the criteria that factor loads of the clauses should be at least 0.35 (Field, 2000; Hair *et al*., 2006), and the difference

between the item factor loads included in the 2 factors should be at least 0.10 (Tabachnick & Fidell, 2001). The 4 items (3, 5, 19, 26), which were not appropriate to our criteria were excluded from the scale. The remaining 27 items were subjected to a new principal components analysis with varimax rotation. The scree plot suggested that 6 factors should be extracted (Figure 1), which explained 53.86% of the variance (Table 2). According to the Pett *et al*. study of 2003 and the Hair *et al*. study of 1995 (cited in Williams *et al*., 2010) in humanity studies, the explained variance is commonly as low as 50-60%.

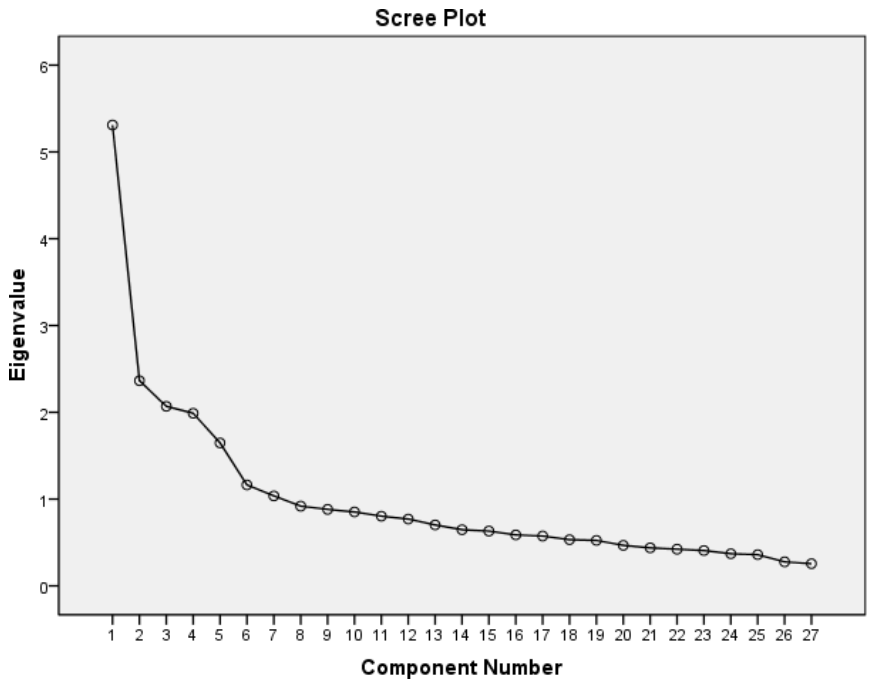

FIGURE 1. **SCREE PLOT OF EXPLORATORY FACTOR ANALYSIS**

Factor 1 (5 items) accounted for 13.33% of the variance and measured „Skill-acquisition strategies.“ Factor 2 (6 items) accounted for 9.24% of the variance and measured „Time-management strategies.“ Factor 3 (5 items) accounted for 8.54% of the variance and measured „Inter-personal relations.“ Factor 4 (5 items) accounted for 8.50% of the variance and measured „Financial management.“ Factor 5 (3 items) accounted for 7.14% of the variance and measured „Intra-personal validation strategies.“ Factor 6 (3 items) accounted for 7.09% of the variance and measured „Physical fitness strategies.

TABLE 2. **EFA (VARIMAX ROTATION) OF LNSS ITEMS (n=400)**

Scale	Factor Loading	Variance	*α*
Time-management strategies (Factor 2)		9.245	0.703
1. I cut short my activity session	0.674		
2. I get up earlier or stay up later	0.575		
4. I cut short time for work, school, and family	0.673		
6. I cut short time for other leisure activities	0.660		
7. I've altered the time that I would normally participate	0.674		
8. I choose to participate at times the facilities are not crowded	0.513		
Skill-acquisition strategies (Factor 2)		13.334	
9. I utilise campus resources to learn what activities are offered	0.609		
10. I try to learn new skills/activities	0.705		
11. If I'm not skilled, I swallow my pride and do the best I can	0.673		
12. If I'm not skilled, I ask for help with the activity	0.749		
13. I practice so I am better at the activity	0.635		

Inter-personal relations strategies (Factor 3)		8.545	0.729
14. I participate in activities with people of the same gender	0.675		
15. I try to find people to participate with	0.591		
16. I try to find someone to give me a ride	0.745		
17. I encourage my friends to participate with me	0.612		
18. I adjust my activity choice based on what my friends want to do	0.717		
Intra-personal validation strategies (Factor 5)		7.147	0.727
20. I participate in activities that I am good at	0.668		
21. I purposely participate in activities that are not competitive	0.839		
22. I try to select activities where I can avoid conflict with others	0.797		
Physical fitness strategies (Factor 6)		7.092	0.700
23. I try to eat right so I feel like participating	0.758		
24. I try to sleep more so I feel like participating	0.721		
25. I try to improve my physical fitness so I can participate	0.694		
Financial management (Factor 4)		8.500	0.716
27. I try to budget my money so I can participate	0.539		
28. I improvise with the equipment/clothes that I have	0.602		
29. I got a job so I would have money to help me participate	0.604		
30. I borrow equipment/clothes from others so I can participate	0.741		
31. I participate in less expensive activities	0.722		
TOTAL		**53. 863**	**0.813**

The reliabilities of the *LNSS* sub-scales were assessed by Cronbach‟s alpha coefficient and the item-total correlations from each dimension. In this case, for Cronbach‟s alpha coefficients, acceptable criteria were ≥0.70 (Nunnally & Bernstein, 1994).

Confirmatory Factor Analysis

The *LNSS* was tested with first order CFA and second order CFA analyses, using the sub-factor structure determined by the EFA. In the first order CFA, to evaluate the absolute fit, χ^2 (minimum fit function test), RMSEA, GFI, and SRMR were used. The AGFI, NFI, TLI and CFI were used as incremental fit measures. The χ^2 statistic is generally significant in large samples (Byrne, 1989). For this reason, rather than only using χ^2 values, a ratio of the calculated χ^2 to the degrees of freedom was recommended. It is desirable that this ratio (χ^2/df) is below 5 (Klem, 2000; Sumer, 2000). The results showed that χ^2 values were significant (χ^2=947.71, df=309, χ^2/df=3.06, p<0.000). High values were found for the fit indexes TLI (0.90) and CFI (0.92), indicating a good fit. In addition, it is desirable for RMSEA (0.071) and SRMR (0.071) values to be lower than 0.08 (Anderson & Gerbing, 1988; Hu & Bentler, 1999; Sumer, 2000; Schermelleh-Engel *et al*., 2003; Hooper *et al*., 2008). GFI, AGFI and NFI values higher than 0.90 in fix indexes show a good fit (Marsh & Hocevar, 1988), but the 0.85-0.90 range for GFI, AGFI and NFI value higher than 0.80 shows the existence of an acceptable fit (Marsh *et al*., 1988). GFI (0.85), AGFI (0.82) and NFI (0.87) were found in this research. The values determined in this study complied with these criteria.

TABLE 3. **CFA MAXIMUM LIKELIHOOD ESTIMATES OF FIRST ORDER**

Item no.	Factor loading estimates*	t-Values	Estimated error variances
1	0.63	10.45	0.65
2	0.56	8.39	0.77
4	0.49	8.02	0.79
6	0.52	9.10	0.73

7	0.50	8.58	0.76
8	0.47	6.93	0.84
9	0.63	11.56	0.68
10	0.83	17.93	0.36
11	0.81	14.34	0.54
12	0.74	14.83	0.52
13	0.67	13.15	0.60
14	0.35	6.01	0.90
15	0.65	14.56	0.51
16	0.52	9.04	0.78
17	0.78	16.89	0.37
18	0.53	9.48	0.76
20	0.71	12.65	0.55
21	0.74	12.36	0.57
22	0.73	12.32	0.57
23	0.79	13.64	0.51
24	0.60	9.86	0.73
25	0.74	14.24	0.47
27	0.83	17.69	0.37
28	0.80	19.17	0.29
29	0.64	10.91	0.71
30	0.38	6.21	0.90
31	0.46	8.50	0.81

*Factor loading estimates are not standardised. (n=410)

According to the CFA in Table 3, the factor loadings (k) changed between 0.25 and 0.81. The absolute value is preferred to be higher than 0.10. If the value is less than 0.10, it denotes a „small effect"; if around 0.30 it denotes a „medium effect"; and if higher than 0.50 it denotes a „large effect" (Kline, 2005). Factor loadings generally had a large effect in this study. Also, the t-values of all items were significant. The estimated item-factor loadings, estimated error variances and t-values are shown in Table 3.

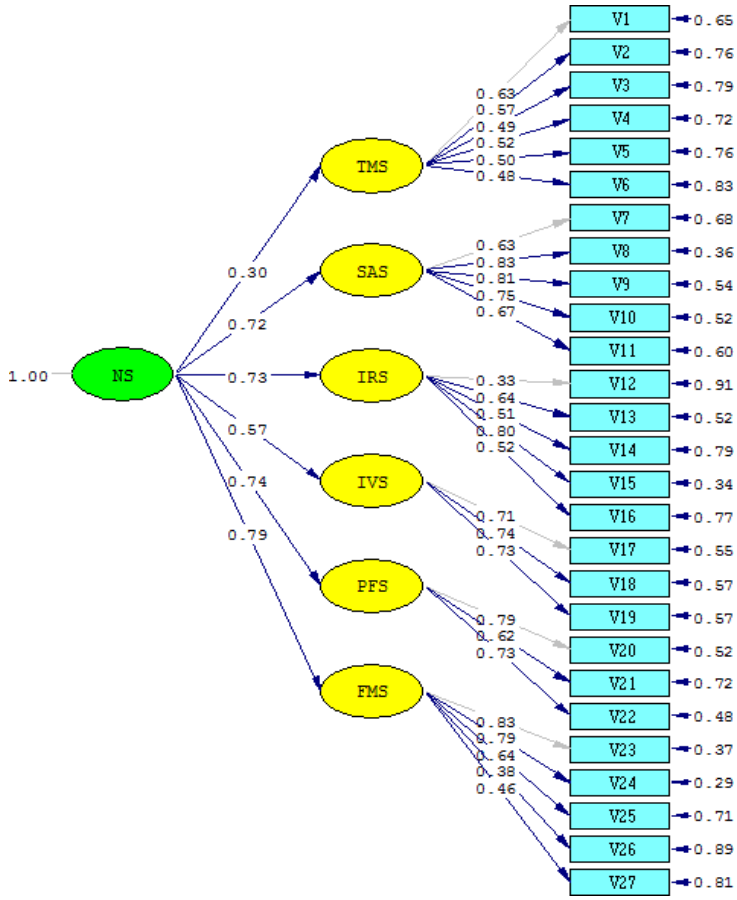

FIGURE 2. **SIX-FACTOR MODEL OF LEISURE NEGOTIATION SCALE SCORES**

Significant χ^2 values were also found in the second analysis (χ^2=992.00, df=318, χ^2/df=3.11, p<0.000). High values were found for the fit indexes GFI (0.85), AGFI (0.82), NFI (0.87), indicating an acceptable fit and TLI (0.90), CFI (0.91), indicating a good fit, and the values of RMSEA (0.072) and SRMR (0.074) were below 0.08. These values show that the 6-factor structure of the scale gives acceptable and valid results. The scores for the factor-scale relationships in the second order CFA are shown in Figure 2.

Reliability

The stability of the scale was established by evaluating test-retest reliability. There was a significant positive correlation between the 2 tests. The 2-week test-retest reliability scores were: 0.83 (time-management strategies); 0.83 (skill-acquisition strategies); 0.80 (inter-

personal relations); 0.89 (intra-personal validation); 0.85 (physical fitness strategies); and 0.86 (financial management). There were no significant differences between the mean values for the 2 sessions (p>0.05).

DISCUSSION

The purpose of this study was to examine the validity and reliability of the Turkish version of the *LNSS* for university students.

Jackson *et al.* (1993) classified leisure negotiation strategies as cognitive and behavioural. Jackson and Rucks (1995) conducted a qualitative study to classify negotiation strategies where negotiation strategies were classified as cognitive and behavioural based on the study of Jackson *et al.* (1993). According to the statistics they derived from their research, Jackson and Rucks (1995) focused on behavioural strategies and classified them under titles: „Modify time", „Acquire skills", „Change inter-personal relations", „Improve finances", „Physical therapy", „Change leisure aspirations", „Other". In this study, they recommend that these strategies should be subject to further empirical investigations.

Hubbard and Mannell (2001) tested leisure constraint negotiation models by developing a scale based on the list of strategies derived from Jackson and Rucks" (1995) study and the comments of their own study participants. Structural equation modelling was used in this study to test the different models where the negotiation strategies scale was used. Some of the tested models were validated and the reliability of the negotiation strategies scale was checked. In this study the scale consisted of the subscales, namely „Time", „Skill", „Social" and „Finances". By using the current scale and the constructs used, Elkins (2004) developed and adapted all the constructs of the previous studies to campus recreational sport. Besides „Time management", „Skill acquisition", Interpersonal relations", „Intra-personal relations", „Financial management" strategies mentioned in previous studies, Elkins (2004) added „Physical fitness" strategies.

A Pearson correlation coefficient of r=0.92 was found in relation to the consistency between the Turkish and English forms of the *LNSS* and there was no significant difference between the mean values on the 2 versions ($p>0.05$). These findings indicate that the consistency between the 2 versions of the scale is at an acceptable level and language equivalence has been attained. For determining the structural validity and factor structure of the *LNSS*, the EFA and the CFA methods were used. Kaiser-Meyer-Olkin (KMO) and Bartlett"s Test of Sphericity were applied in the first stages of the EFA. A very high value (0.811) was found for KMO, which is well above the value of 0.70 and is the acceptable limit for this test. The result of Bartlett"s Test of Sphericity was found to be 3500.75 ($p<0.001$). This demonstrates that the sample size was sufficient for the application of a factor analysis and the data were appropriately distributed. The 4 items (3, 5, 19, 26) which were not appropriate to our criteria were excluded from the scale. After excluding these items, the scale consisted of 6 sub-factors (time management, skill acquisition strategies, interpersonal relations, intra-personal validation, physical fitness strategies and financial management). All items had high loadings on their respective factor, consistent with the original form. The 6 factors explained 53.86% of the total variance. According to the humanity studies of Pett *et al.* in 2003 and Hair *et al.* in 1995 (cited in Williams *et al.*, 2012), the explained variance is commonly as low as 50-

60%. The validity of the 27-item, 6-factor structure of the *LNSS* was first determined by the EFA, followed by first-order and second-order CFA related to the one-dimensionality of the scale that was applied.

Cronbach‟s alpha coefficient for the reliability of the *LNSS* was ≥0.70 for all sub-factors (Nunnally& Bernstein, 1994), and the test-retest correlations conducted within a 2-week interval were high, indicating reliability of the scale. The results of the validity and reliability analyses on the data from 810 students have shown that the *LNSS*, which has 6 factors consisting of 27 items, is a reliable and valid instrument for measuring the negotiation strategies of university students towards recreational sport on campus.

CONCLUSION

In conclusion, the results of this study demonstrated that the Turkish version of the scale is a valid and reliable instrument for university students.

LIMITATIONS AND FUTURE RESEARCH

The most important limitation of this study was that the data were derived from only the Akdeniz University. The instrument was applied to a convenient sample of students in order to prevent the limitation of generalizability of the results. Nevertheless, the students in the Akdeniz University were selected from physical education and fine arts courses alternatively every term. Hence, the results obtained from this group could be generalised to other university students on the campus or other university students.

The second limitation of the study was that the scale was originally developed in the English language. So, it is recommended that future studies should develop an original scale in the Turkish language rather than adapting an existing instrument. However, this study is considered to be the first step in this direction.

In order to further examine the validity of the scale, future studies could examine its correlation with other scales, and determine the validity and reliability of the scale for the other groups (academic personnel) participating in recreational sport on campus. Using this scale could make significant contributions to the measurement power. Future studies based on conducting the same adaptation procedures in order to make intercultural comparisons would make a valuable contribution to the studies of leisure. For Turkish academics the development of a new *LNSS* in Turkish and making a parallel test validation of the scale with the original *LNSS* might be a good challenge.

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