South African Journal for Research in Sport, Physical Education and Recreation Social Sciences, 2023, ISBN: 0379-9069

www.sajrsper.com

HIGH SCHOOL WATER POLO TALENT DEVELOPMENT ENVIRONMENTS AND TEAM COHESION: PERFORMANCE COMPARISONS AND CORRELATIONS

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ABSTRACT

Organised school sport is integral to the development pathways of most South African sports. The highly competitive nature of inter-school leagues often prioritises short-term success over long-term player development. The study compared successful and less successful teams in various talent development environments (TDE) and team cohesion variables based on the log position of a high school's tournament (u/15 and u/18 age-groups) and established correlations between these variables. A cross-sectional design was used, and 146 boys (average age: 15.51±1.23 years) completed the Talent Development Environment Questionnaire (TDEQ-5) and the Youth Sport Environment Questionnaire (YSEQ) before the 2020 Mazinter Cup. The top three u/18 teams had significantly higher TDEQ-5 (Overall), Alignment of Expectations, Support Networks, YSEQ (Overall Cohesion), Task Cohesion and Social Cohesion scores than the bottom three teams. The results underscore the well-established cohesion–performance relationship. There were no differences at the u/15 level, where players competed in this age-group for the first time. Moderately strong positive correlations existed between various TDEQ-5 and YSEQ variables. Fostering team cohesion is integral to successful TDEs. Long-term player development and team success can be pursued simultaneously.

Keywords: Alignment of expectations; Long-term player development; Support networks; Task cohesion; Social cohesion

INTRODUCTION

The pathways from youth to elite sport and the reasons why successful junior athletes do or do not successfully transition to the senior level are important research topics (Coutinho *et al*., 2016). Organised school sport (as opposed to club sport) forms the bedrock of South Africa's elite sport system and the pathway from youth to elite sport (Jacobs *et al*., 2019). The highly competitive nature of inter-schools leagues has resulted in a "win-at-all-costs" mentality (Gradidge *et al*., 2010). Coaches and schools are pressured to win because of more television coverage, media exposure and prizemoney (Larsen *et al*., 2013), and success allows them to recruit future athletic stars. Likewise, athletes are under pressure for provincial and national

team selection and to earn bursaries for tertiary education. The resulting pressure to perform and achieve short-term success often outweighs implementing a long-term player development approach (Van den Berg & Surujlal, 2013) and the holistic development of the young athlete's athletic abilities (Larsen *et al*., 2013). School sport should prioritise the physical and psychosocial development of young athletes (Cumming *et al*., 2007), but the question is to what extent schools can pursue individual player development and performance simultaneously. This study took a long-term athlete development (LTAD) approach to explore an environment (competitive high school sport) in which talented athletes are developed.

South Africa adapted Balyi's LTAD model (Balyi & Hamilton, 2004) to the local context, renaming it the Long-term Participant Development (LTPD) model. The model guides the development of participants from a grassroots level to the senior competitive level. The high school years (grades 8 to 12), coincide with stages four and five of the LTPD model. Stage four, the "train to train" stage (boys aged 12 to 16 years), focuses on the process rather than the outcome. This stage aims to improve strength and sport-specific skills and lay a solid aerobic base. Stage five, the "train to compete stage" (boys aged 16 to 18 years), focuses on optimal fitness preparation, and individual and position-specific skills, as well as team performance (Balyi & Hamilton, 2004). Despite the popularity and intuitive appeal of the model there is little empirical evidence about its effectiveness.

The characteristics of environments where athletic talent can be developed effectively is a growing research topic. Martindale *et al.* (2005; 2007) identified key features of effective ta lent development environments (TDEs), including (1) long-term goals and approaches; (2) comprehensive, rational messages and encouragement; (3) prioritising development over immediate "success"; (4) personalised and continuous development; and (5) integrated, coherent and methodical development. The whole environment, rather than specific individuals within the environment, is responsible for optimising talent development (Larsen *et al*., 2013). Whilst a LTAD approach is desirable and holds long-term benefits, the competitive nature of sport means that performance is highly valued. Sports performance factors and their monitoring are important research areas (e.g., Cruickshank & Collins, 2012; Serrano *et al*., 2013; Skarbalius *et al*., 2019). Henriksen (2010) argued that effective TDEs can realise individual player development whilst simultaneously pursuing team performance. However, there appears to be a research gap on TDEs regarding tournament performance outcomes. The study intended to close this gap by comparing more and less successful teams (at u/15 and u/18 age-group levels) on various TDE variables, based on their final tournament log position.

One performance factor that has received extensive research attention within the team sport context is the cohesion among players and with their coaching staff. The most widely used definition of cohesion states that it is "a dynamic process that's reflected in the tendency of a group to stick together and remain united in pursuit of its instrumental objectives and/or for the satisfaction of member affective needs" (Carron *et al*., 1998: 213). The meta-analysis of Carron *et al.* (2002b) concluded that cohesiveness may contribute to better performances, but that the tendency for the group to experience greater cohesion after a successful performance may be

even stronger. More successful teams at the Olympic Games attributed part of their success to team cohesion, stating that they respected and encouraged their teammates to perform at a higher level. Teams who were less successful attributed it to the lack of team cohesion and role clarity (Gould *et al*., 1999). The current study endeavoured to contribute to the existing body of knowledge by determining how the team cohesion of more and less successful high school water polo teams differed.

Qualitative studies (e.g., Dove, 2018) may enable us to understand how cohesion affects athletic environments and the players' perceptions of their environments; however, there appears to be limited quantitative information on the relationship between successful TDE characteristics and team cohesion. The study aimed to address this limitation by determining this relationship. For example, cohesion is influenced by goal setting (e.g., Widmeyer & Ducharme, 1997), communication (e.g., McLaren & Spink, 2020) and social support (e.g., Fraser & Spink, 2002), three key factors of successful TDEs. Hence, we expected a correlation between cohesion and certain TDE variables (i.e., those that pertain to group processes and interaction) but had to test this hypothesis.

High schools are key to the future growth of South African water polo and provide a pathway for players to achieve success at the senior level. The South African Sports Confederation and Olympic Committee (SASCOC) and Swimming South Africa (SSA) emphasised the importance of water polo at high school level because it provides a platform for lifelong participation (SASCOC & SSA, 2013). This study was subsequently delimited to water polo players from six leading high schools in the Western Cape Province of South Africa. The two age-groups under investigation (u/15 and u/18) align with LTPD model stages four and five. The study's primary aim was to compare the more and less successful teams on various TDE and cohesion dimensions, based on their tournament performance and for two age-group competitions. The secondary aim was to determine correlations between the TDE and cohesion variables for the whole sample.

METHODS

Research design

The study utilised a cross-sectional descriptive research design with a convenience sample, comprising high school participants in a water polo tournament. Demographic information and quantitative data were collected and allowed between-group comparisons between the more and less successful teams from two age-group samples. Correlation coefficients between various talent development and cohesion variables were determined for the total sample.

Participants

High school water polo players (N=146) aged 13 to 18 years, who competed in the 2020 Western Cape Summer League and Mazinter Cup water polo tournaments for boys, participated in the study. There were six u/15 teams (n=72) and six u/18 or first teams (n=74). Table 1 reports the player age and the number of seasons played for their respective age-group teams.

Table 1. **AGE AND PLAYING HISTORY OF PARTICIPANTS**

	All players (N=146)	U/15 players (n=72)	U/18 players (n=74)
Age (years): M (SD)	15.51 (1.23)	14.53 (0.56)	16.46 (0.89)
Number of seasons: M (SD)	1.77 (1.37)	1.0 (0.0)	2.53 (1.60)
First season at this age-group level*	100 (68.49%)	72 (100%)§	28 (37.84%)#
Second season at this age-group level*	10 (6.85%)	–	10 (13.51%)#
Third season at this age-group level*	22 (15.07%)	–	22 (29.73%)#
Fourth season at this age-group level*	5 (3.42%)	–	5 (6.76%)#
Fifth season at this age-group level*	1 (0.68%)	–	1 (1.35%)#
Sixth season at this age-group level*	8 (5.48%)	–	8 (10.81%)#

* The South African academic year starts in January. The December (summer) holiday splits the water polo season in two: one season spans the last quarter and the next season the first quarter of the calendar year.

§ The u/15 players already completed a full year of water polo at the u/14 level; however, this was their first season at u/15 level.

Most of the u/18 players would have played two seasons at the u/14 and two seasons at the u/15 age-groups.

Procedures

Instruments

Talent Development Environment

The Talent Development Environment Questionnaire (TDEQ-5) was used to measure the encounters of the players with important attributes of efficient TDEs (Martindale *et al.*, 2010). The instrument consists of 25 items that measures five subscales: (1) Long-Term Development Focus (5 items) – degree to which the programmes are intended to promote athletes' long-term prosperity (foundational training and holistic development, consistent opportunities, and reduced extrinsic rewards); (2) Alignment of Expectations (5 items) – degree to which goals are methodically arranged and organised (establishing goals, goal assessment and personalised goals); (3) Communication (4 items) – degree to which the coach speaks constructively with the player in both conventional and relaxed surroundings (developmental path, motive for training and evaluation); (4) Holistic Quality Preparation (7 items) – degree to which intervention programmes both within and outside the sport setting are put together (compassionate coaching, intelligible guidance, psychological preparation and a well-rounded lifestyle); and (5) Support Networks (4 items) – degree to which rational, friendly and comprehensive support networks are accessible to the player in every domain (professionals, coaches, families and schools). The TDEQ-5 can be used to identify strengths and weaknesses in TDEs and to monitor changes over time (John Wang *et al.*, 2011; Mills *et al.*, 2014).

The instrument utilised a 6-point Likert-type scale (1="strongly disagree", 6="strongly agree"). Internal reliability for the subscales ranged from .79 to .86 (Li *et al.*, 2015). The current dataset yielded the following inter-reliability indices: TDEQ-5 Overall (α=.80), Long-term Development Focus (α=.53), Alignment of Expectations (α=.62), Communication (α=.67), Holistic Quality Preparation (α=.73), and Support Networks (α=.69). The alphas for the Long-term Development Focus subscale were low, requiring cautious interpretation.

Cohesion

The Youth Sport Environment Questionnaire (YSEQ) asked participants to indicate their agreement to 18 items on a 9-point Likert-type scale (1="strongly disagree", 9="strongly agree") (Eys *et al*., 2009). The questionnaire is a more suitable measure of cohesion among junior athletes (13 to 18 years of age) than other popularly used cohesion scales. Sixteen items contributed to Task Cohesion and Social Cohesion: Task Cohesion (8 items) – individuals' understanding of the amount of unification acquired by the group surrounding task characteristics (group aims and ambitions), and Social Cohesion (8 items) – individuals' understanding of the amount of unification of the group surrounding social characteristics (social bonds and camaraderie) (Eys *et al*., 2009). Two negative spurious items were not used to calculate the subscale scores.

Eys *et al.* (2009) showed content, factorial and predictive validity. Acceptable inter-item reliability was reported by two studies for Task Cohesion (α=.89, .91) and Social Cohesion (α=.93, .94) (Eys *et al*., 2009; 2013). The dataset of the current study yielded acceptable alphas: YSEQ (Overall Cohesion) (α=.71), Task Cohesion (α=.90) and Social Cohesion (α=.93).

Tournament performance

The Water Polo Summer League consisted of a round-robin format in which the leading six high schools in the Western Cape competed against each other. Data from both the u/15 and u/18 tournaments were captured. The top four teams from the tournament qualified for the Mazinter Cup, a knockout tournament in which the top-ranked team from the summer league faced the fourth-ranked team and the second-placed team faced the team ending third in the semi-finals. The winners from those two matches played against each other to determine th e overall winner, whilst the losers played against each other for third and fourth place. This resulted in a final log-standing, with teams in each age-group tournament ranked from one to six. Teams from both age-group categories were divided into two subgroups, namely the top three (i.e., more successful) and bottom three (i.e., less successful) teams.

Ethical considerations

Ethical clearance was obtained from the Stellenbosch University Research Ethics Committee for Social, Behavioural and Educational Research (REC: SBE: 13117), the Western Cape Education Department, Western Cape Schools Water Polo and South Africa Water Polo. The coaches and managers of each school gave institutional permission. The study was explained to all participants at the respective schools and their voluntary participation was requested. Informed consent was obtained from the parents/legal guardians of the child participants

because the study included participants who were 18 years and younger. Information sheets, informed consent and assent forms were distributed, and the signed forms were returned via email. Confidentiality and anonymity of the individual results were ensured.

Statistical analysis

Levene's test demonstrated equality of variance for the respective groups, with all variables reaching p-values >0.05. The data were distributed normally and the dataset was large enough to permit the use of parametric tests. Descriptive statistics [mean (M) and standard deviation (SD)] of the TDEQ-5 and YSEQ subscales were calculated. A one-way analysis of variance (ANOVA), with a least-significant-difference (LSD) post-hoc procedure, was used to identify the groups whose means differed statistically and to compare the top three and bottom three teams in each age-group category. Pearson product-moment correlation (r) was used to calculate the correlation coefficients between the respective TDEQ-5 and YSEQ variables. Statistical significance was set at $p<0.05$ throughout.

RESULTS

Descriptive results [M (SD)] were calculated for the top three and bottom three teams from each age-group tournament. An ANOVA was conducted for each of the nine TDEQ-5 and YSEQ variables. Table 2 reports the F-values, degrees of freedom (df) and p-values, as well as the results of the LSD post-hoc test which was performed to determine if the top three and bottom three teams from each age-group differed significantly. No differences were observed between the more and less successful u/15 teams on any of the tested variables. These players were all competing in their first tournament in this age-group. Only 2 months into the new school year, they would have had little time to adjust to the new environment. It is plausible that between-group differences would become visible when teams have been together for longer, as was the case with the u/18 teams, where many of the players had played together during previous seasons (see Table 1).

Amongst the u/18 teams, the top three teams had higher scores than the bottom three teams for all the tested variables. These differences were significant for TDEQ-5 (Overa ll), Alignment of Expectations and Support Networks, whilst Holistic Quality Preparation just exceeded the threshold of significance ($p=0.06$). The top three u/18 teams also reported significantly greater unification around task characteristics (Task Cohesion) and social characteristics (Social Cohesion) than the bottom three teams. Subsequently, the top three u/18 teams demonstrated significantly greater cohesiveness (YSEQ Overall).

Table 2. **TEAM PERFORMANCE COMPARISONS FOR THE TALENT DEVELOPMENT ENVIRONMENT AND TEAM COHESION VARIABLES FOR U/15 AND U/18 TEAMS**

	U/15 teams			U/18 teams		
	Top 3 teams	Bottom 3 teams		Top 3 teams	Bottom 3 teams	
	M (SD)	M (SD)	p	M (SD)	M (SD)	p
TDEQ-5 (Overall)		F(1,142)=4.197, p=0.04*				
	4.31 (0.71)	4.37 (0.60)	0.73	4.40 (0.58)	4.02 (0.63)	<0.01**
Long-Term Development Focus		F(1,142)=4.059, p=0.05				
	4.74 (0.61)	4.94 (0.43)	0.19	4.84 (0.71)	4.62 (0.68)	0.13
Alignment of Expectations		F(1,142)=1.742, p=0.19				
	4.36 (0.88)	4.12 (0.77)	0.19	4.11 (0.66)	3.54 (0.74)	<0.01**
Communication		F(1,142)=0.048, p=0.83				
	4.27 (1.14)	4.09 (1.01)	0.42	4.28 (0.80)	4.02 (0.92)	0.26
Holistic Quality Preparation		F(1,142)=3.518, p=0.06				
	4.11 (0.89)	4.29 (0.90)	0.38	4.31 (0.80)	3.96 (0.85)	0.08
Support Networks		F(1,142)=5.855, p=0.02*				
	4.09 (0.99)	4.39 (0.85)	0.19	4.46 (0.98)	3.98 (1.11)	0.04*
YSEQ (Overall)		F(1,142)=19.640, p<0.01**				
	7.15 (1.14)	6.84 (1.10)	0.28	7.75 (0.82)	5.71 (1.58)	<0.01**
Task Cohesion		F(1,142)=33.514, p<0.01**				
	7.07 (1.20)	6.71 (1.08)	0.21	7.98 (0.71)	5.28 (1.72)	<0.01**
Social Cohesion		F(1,142)=5.056, p=0.03*				
	7.23 (1.44)	6.98 (1.50)	0.50	7.52 (1.17)	6.14 (1.92)	<0.01**

* p<.05, ** p<.01
TDEQ-5=Talent Development Environment Questionnaire-5 YSEQ=Youth Sport Environment Questionnaire

Pearson product-moment correlations (r) were used to establish the correlations between the six TDEQ-5 and three YSEQ subscales (See Table 3). The strongest relationship was noted between TDEQ Alignment of Expectations and YSEQ Overall (r=0.51). Moderate correlations (r=0.40–0.49) were observed for: (1) TDEQ Alignment of Expectations and YSEQ Task Cohesion (r=0.43); (2) TDEQ Alignment of Expectations and YSEQ Social Cohesion (r=0.46); (3) TDEQ (Overall) and YSEQ Social Cohesion (r=0.47); and (4) TDEQ (Overall) and YSEQ (Overall) (r=0.49). The remaining correlations were significant but weak.

Table 3. **CORRELATION COEFFICIENTS BETWEEN THE TALENT DEVELOPMENT ENVIRONMENT QUESTIONNAIRE AND YOUTH SPORTS ENVIRONMENT QUESTIONNAIRE VARIABLES**

	YSEQ Overall	Task Cohesion	Social Cohesion
TDEQ Overall	r=0.49 (p<0.001)	r=0.39 (p<0.001)	r=0.47 (p<0.001)
Long-Term Development Focus	r=0.29 (p<0.001)	r=0.23 (p=0.006)	r=0.29 (p<0.001)
Alignment of Expectations	r=0.51 (p<0.001)	r=0.43 (p<0.001)	r=0.46 (p<0.001)
Communication	r=0.38 (p<0.001)	r=0.28 (p<0.001)	r=0.39 (p<0.001)
Holistic Quality Preparation	r=0.35 (p<0.001)	r=0.30 (p<0.001)	r=0.33 (p<0.001)
Support Networks	r=0.30 (p<0.001)	r=0.23 (p=0.005)	r=0.30 (p<0.001)

TDEQ-5=Talent Development Environment Questionnaire-5 YSEQ=Youth Sport Environment Questionnaire

DISCUSSION

The primary aim was to compare more and less successful teams on various TDE and cohesion dimensions based on their tournament performance and for two age-group competitions. The inclusion of two age-group comparison groups was a strength of the study. No between-group differences were observed among the u/15 teams, suggesting that between-group differences may only develop when players have been in an environment for longer. The u/15 age-group aligns with LTPD model stage four, or the "train to train" stage, in which performance is not the priority. The u/18 age-group coincides with stage six or the "train to compete" stage, where competition and performance become more important. The more successful u/18 teams held more favourable perceptions about their environment than the ir less successful counterparts. Significant between-group differences were reported for Talent Development Environment (Overall), Alignment of Expectations, Support Networks, Overall Group Cohesion, Task Cohesion and Social Cohesion.

These findings add to the existing knowledge on the role of the environment in the development of prospective athletes competing at the u/18 age-group level, by showcasing that environments with a strong developmental focus at the same time performed better. Alignment of Expectations (how individual and team goals are arranged and organised) was identified as a significant team performance factor. Well-aligned team goals increase productivity, and performance through enhanced concentration, tactical development, strategic motivation and perseverance (Burton & Raedeke, 2008). Effective teams should review and modify their goals

frequently (Fleming & Monda-Amaya, 2001). Coaches and athletes should realise that goal setting is a complex process and that expectations should be managed sensitively (Weinberg, 2013).

Another team performance factor highlighted through the current results was Support Networks. Youth sport development comprises multiple interactions between different stakeholders and various aspects of the contextual environment (Neely & Holt, 2011). Social support from various sources is important in the development of youth athletes (Sheridan *et al*., 2014). Coaches, managers, sport scientists and sports medicine personnel all contribute to the environment in which talent is nurtured and developed. Environments that are deemed constant and supportive provide continuous positive social experiences tha t will inevitably impact the athlete's development positively (Van den Berg & Surujlal, 2020).

The top-performing teams had better Overall Group Cohesion, Task Cohesion and Social Cohesion scores than the bottom-placed teams. These results support the well-established performance–cohesion relationship (e.g., Grieve *et al.,* 2000; Carron *et al.,* 2002a; 2002b; Iona-Sabin & Marcel, 2014; Dobersek *et al.,* 2014; Asamoah & Grobbelaar, 2017). Carron *et al.* (2002a) found a reciprocal relationship between both task and social cohesion and performance. The meta-analysis of Carron *et al.* (2002b) suggested that team-building activities, such as team campouts and social interactions outside the sporting context, could contribute to social cohesion and improved performances. High social cohesion may, however, not always be desirable as athletes may succumb to pressure and demonstrate behaviour to please the group. Pressure to conform, groupthink and decreased individuality are linked to overly strong social cohesion (Carron *et al*., 1994; Paskevich *et al*., 2001; Rovio *et al*., 2009).

The secondary aim was to establish the correlations between the TDEQ-5 and YSEQ subscales. Significant weak to moderately strong correlation coefficients were reported. Stronger correlations were noted for the TDE variables that pertained to group processes (i.e., Alignment of Expectations, Communication and Support Networks), than the variables that focused on the individual athlete (i.e., Long-term Development Focus and Holistic Quality Preparation).

Alignment of Expectations–Cohesion relationship

Team goal setting is a constructive group activity that encourages open communication to align all team member's individual goals with those of the group (Widmeyer & Ducharme, 1997). Clearly stated team goals contribute to both task and social cohesion (Kingston & Wilson, 2008; Senécal *et al*., 2008). The process of setting, evaluating and revising goals are important for strong team cohesiveness, whereas strong cohesion provides the climate in which shared goals can be pursued collectively.

Communication–Cohesion relationship

In effective teams, communication occurs on multiple levels: between the coaching staff and athletes, and among the athletes themselves. All team members are responsible for improving communication pathways (Young & Post, 1993). Team members also share the responsibility

of maintaining strong cohesion to achieve the team's objectives (Carron *et al.,* 1998). Team-building activities should encourage effective communication to enhance coordination among team members (social cohesion), as open and honest communication characterise successful teams (Lu, 2015).

Support Networks–Cohesion relationship

Supportive environments allow athletes to feel comfortable around each other (McEwan & Beauchamp, 2014). Insufficient support can negatively affect team functioning and lead to frustration over team roles (Rosenfeld & Richman, 1997). Interventions aimed at enhancing social support positively influence team cohesion by bringing players and other stakeholders together (Kozlowski & Ilgen, 2006). These results suggest that effective TDEs may contribute to stronger team cohesion and that team cohesiveness may in turn provide environments conducive for athletic talent development.

LIMITATIONS

The TDEQ-5 and YSEQ have not been validated for use in the South African population. To the best of our knowledge, only one local study has utilised the TDEQ-5 to date (Van den Berg & Surujlal, 2013). The inclusion of male players from a single province in South Africa limits the generalisability of the results. Cross-sectional research does not provide insight into how cohesion may fluctuate throughout the tournament and cannot account for the influence of individual match results and other group factors.

CONCLUSIONS

The more and less successful u/18 teams differed in their TDEQ-5 Overall score, and Alignment of Expectations and Support Networks subscale scores. Likewise, there was also a difference among the u/18 teams for Cohesion. There were no between-group differences among the u/15 players. High schools should prioritise long-term talent development and the nurturing of players over short-term success. Significant, moderately strong correlations between various TDEQ-5 and YSEQ subscales suggest that effective talent development environments may strengthen team cohesion and that team cohesiveness may in turn contribute to environments in which athletic talent can be developed effectively.

IMPLICATIONS FOR PRACTITIONERS

High schools should prioritise long-term player development and the nurturing of players over short-term success. Environments that focus on long-term player development and that foster strong team cohesion bode well for team performance, due to the association between these variables. Coaches and support staff should endeavour to enhance both the social and task dimensions of cohesion to increase team effectiveness and performance but should be wary of overly high social cohesion. Individualised and continuous player development, as well as coherent messages and support from support networks and other stakeholders, may enhance the short-term team performance and long-term individual development outcomes.

RECOMMENDATIONS FOR FUTURE RESEARCH

Future studies should be extended to athletes from other provinces in South Africa and to female participants. More research is needed to explore and guide the development of effective environments in which to develop talent in African contexts because most studies to date have been conducted in Europe, Scandinavia, and the United States of America.

Acknowledgements

We acknowledge the assistance of Prof Martin Kidd from the Statistical Consultation Services at Stellenbosch University. We appreciate the Western Cape Education Department, Water Polo South Africa, Western Cape Schools Water Polo, and the participating schools for granting permission to conduct this study. Thank you to the participants for their time.

Conflict of interest

The authors report there are no competing interests to declare.

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