TITLE: Quantification of physiological, movement and technical outputs during a novel small-sided game in young team sport athletes

ABTRACT

The aim of this study was to quantify the physiological responses, time-motion characteristics and technical executions associated with a novel non sport-specific SSG in young team sport players. On six separate occasions, twelve young male team sport athletes (mean ± SD: age,13.0 ± 0.3 years, height, 157.4 ± 4.9 cm, body mass, 47.0 ± 5.0 kg and $\dot{V}O_{2\ peak}$, 55.1± 4.6 $ml\cdot kg^{-1}\cdot min^{-1}$) completed various 'bucketball' SSG formats (i.e. 3 vs. 3, 4 vs. 4 and 6 vs. 6) twice each. Heart rate (HR) was measured during each SSG at 5 s intervals. Time-motion characteristics were measured using global positioning systems. Ratings of perceived exertion (RPE) were recorded immediately after the SSGs using the Borg scale (RPEs, 6 – 20). Technical skill executions were measured using a high-speed digital video camera. Analysis revealed a tendency for the 3 vs. 3 games to elicited higher heart rates (88.3 ± 4.3) than either 4 vs. 4 (85.9 ± 4.9) or 6 vs. 6 formats (85.9 ± 3.2). Total distance travelled at 13 – 17.9 $km\cdot hr^{-1}$ was more during 6 vs. 6 than 3 vs. 3 games (very likely substantial true difference, 97%), and total possessions and number of catches, passes and shots were all higher in 3 vs. 3 compared with 4 vs. 4 and 6 vs. 6 games. There was no different for RPE between game formats. The results of this study indicate that 3 vs. 3 non sport-specific SSGs provide higher stimulus for aerobic fitness adaptation and technical improvement than 4 vs. 4 and 6 vs. 6 formats and their use for training young team sport athletes is recommended.

Key words: aerobic fitness, time-motion, technical actions,

INTRODUCTION

The aerobic capacity of young team sport players substantially influences their technical performance and tactical choices (7). Therefore careful consideration of the most appropriate training approaches, accounting for maturation and skill status, is required to optimise their physical and technical development. Traditionally, training methods for aerobic fitness development have included repeated, high-intensity, intermittent bouts (4, 18) or long continuous steady state efforts (2, 18). However, while these training approaches may be effective and tolerated by adults, they may be less-effective and impractical for younger individuals. Unique challenges exist when prescribing training regimes to young athletes and attempting to maximise enjoyment to ensure adherence and motivation to train.

In recent years, there has been an increased focus on the potential use of small sided games (SSGs) to improve a range of competencies of athletes, including aerobic fitness. Small sided games provide an ideal environment for athletes to develop their technical skills, decision-making and problem solving skills often under stressful physical loads; all of which are critical to the successful long term development of a young team sport athlete. Therefore, it is possible that children will respond better to SSGs than traditional aerobic conditioning methods if sufficient intensity can be achieved. Indeed, most studies to date have attempted to quantify the acute physiological responses and time-motion responses most related to SSG regimes, but these have been limited to either adults (>18 years) (24, 26, 30, 33, 34) or youth (14 – 18 years) aged athletes (4, 6, 20, 22) with little consideration of younger athletes (<14 years), who may be less physically (16) and technically developed (7) than their older counterparts. Furthermore, research to date has predominantly reported the acute physiological responses to SSGs in soccer

(5, 6, 8, 10, 11, 19-24, 29-31, 33, 34) with only limited consideration of SSGs that require control of possession with the hands (4, 12-15), especially in young athletes. It is important to quantify the physical demands of a range of SSG formats since ‘general’ catch and pass games incorporate basic taught skills that could be applicable to a wide range of team sports, if shown to be sufficiently demanding in young athletes.

In adult and youth aged athletes, SSGs played with smaller numbers, while relative pitch area remained constant, have elicited higher heart rates, blood lactate and perceptual responses when compared with games of higher numbers (12, 22, 31, 34). However, research examining altering player number during SSGs in young athletes (i.e. > 14 years) is limited and presents conflicting results. Katis and Kellis (28) reported higher heart rate values in young soccer players during 3 vs. 3 (87.6% HR_{peak}) versus 6 vs. 6 (82.8% HR_{peak}) SSGs. In contrast, Foster et al. (12) reported no significant difference in heart rate intensity between 4 vs. 4 (88.1% HR_{peak}) and 6 vs. 6 (89.3% HR_{peak}) games of “off-side” touch in young rugby league players. Clearly, further research is warranted to better understand the physiological effects of SSGs on young athletes. Furthermore, it is not yet known how varying player number influences the time-motion characteristics during non-soccer SSGs in this age group.

In addition to physical demands of SSGs, the execution and involvement with technical aspects of the game are important for skill development. Indeed, it may be considered that the most effective SSG for young athletes is one that is physically demanding, but also allows players to maximise and refine technical skills and decision making abilities. Surprisingly however, very few studies have reported the effects of varying external factors on technical skill execution during SSGs in young athletes (28). Specifically, Katis and Kellis (25) reported a significantly higher number of technical actions performed by players during 3 vs. 3 soccer SSGs when compared to 6 vs. 6 games. It is unknown how such technical outputs are influenced by player number during a more generic catch and pass game, relevant to a number of team sports (rugby union, rugby league, basketball and netball). Clearly, further research is warranted to better understand the interaction between physiological demands and technical outputs during a variety of types of SSGs in young players. Therefore, the aim of this study was to quantify the physiological responses, time-motion characteristics and technical outputs associated with a novel non sport-specific SSG in young team sport players.

METHODS

Experimental approach to the problem

A cross-over, descriptive design was used in the study which lasted 3 weeks. All participants completed a multi-staged incremental treadmill run to determine peak oxygen uptake ($\dot{V}O_{2peak}$) and peak heart rate (HR_{peak}) and thereafter, on six separate occasions, participated in various SSG formats at the same time of the day, differentiated by player numbers and size of playing area (Table 1). A 1 week training period was used to familiarise participants with testing procedures, the SSG formats, as well as to assess each player in terms of their aerobic fitness, technical skill and game intelligence so that players could be allocated into balanced SSG teams. Players were selected on the same team against the same opponents as often as possible.

Subjects

Twelve young male team sport players (mean ± SD: age,13.0 ± 0.3 years, height, 157.4 ± 4.9 cm, body mass, 47.0 ± 5.0 kg) participated in the study. Their maturation (-0.8 ± 0.4 years) was assessed as time from peak height velocity (PHV) using a non-invasive and practical method based upon anthropometric variables (32). All participants were recreationally trained and involved in at least two training sessions per week, plus a game. All participants and their parents (or guardians) were informed of the procedures and were required to give written informed consent and assent respectively. Approval from the institutional ethics committee for experimentation involving human subjects was gained prior to the commencement of the study.

Procedures

Incremental treadmill running test

Peak oxygen uptake ($\dot{V}O_{2peak}$) was determined during an incremental treadmill running test on a motorised treadmill (PowerJog, Birmingham, UK). The protocol of Armstrong et al. (1) was adopted. Briefly, after a 3 min warm-up at 6 km·hr^{-1} and 1% gradient, the treadmill speed was set at 8 km·hr^{-1} for the initial 3 min stage and increased to 10 km·hr^{-1} for the next stage. Thereafter, treadmill speed was held constant at 10 km·hr^{-1} and the gradient increased by 2.5% every 3 min until the participant reached volitional exhaustion. Participants were verbally encouraged to provide a maximal effort during the final stages of the test. Throughout the test pulmonary gas exchange was measured using a metabolic cart (Parvo TrueOne, UT, USA) which was calibrated for gas and volume prior to each test using alpha grade gases and known volumes. The $\dot{V}O_{2\ peak}$ was defined as the highest 30 s average $\dot{V}O_2$ attained during the test. Heart rate was monitored using short-range telemetry (Polar s610, Kemplele, Finland) and the HR_{peak} determined.

Small-sided games - Bucketball

Bucketball is a two-sided game during which the main objective is to score a goal in the opposing team's bucket (Figure 1). Running with the ball is permitted and it may be passed from the hands, player to player, in any direction. The team with the ball maintains possession until the ball is dropped, goes out of play or a bucket is scored. To score, the player must be outside of the bucket circle (Figure 1). After a goal is scored, play resumes by the team that conceded the goal from the top of their bucket circle. Passes may be intercepted and possession may be stolen from the player with the ball by the opposition dislodging it from their hands however the attacking player cannot be held in any way by the defender. In this study, for a goal to be validated all players had to be positioned inside the oppositions half when the shot was made.

Additional balls were placed along the side-lines of the playing area to ensure play resumed quickly after the ball went out of play.

Participants competed in various formats of bucketball, on separate days, by varying the player numbers, including 3 vs. 3, 4 vs. 4 and 6 vs. 6 formats. Game duration was 16 min of continuous play and the playing area was 25 x 30m, 30 x 40m and 35 x 49m for 3 vs. 3, 4 vs. 4 and 6 vs. 6 games respectively (22, 30, 33). Players performed each SSG two times (6 games total), and games were played in random order. All games were played outdoors on a dry grass surface in temperate conditions (16 Deg C, 50% rH).

Heart rate monitoring

The heart rate (HR) of each player was recorded during each SSG at 5 s intervals using radiotelemetry (VX Sport 220, Visuallex Sport International, Wellington, New Zealand). The mean (HR_{mean}) and HR_{peak} of all SSGs were determined. Relative exercise intensity of each SSG was expressed as percent HR_{peak} (as determined from the incremental test) and classified into 4 intensity zones: zone 1 (<75% HR_{peak}), zone 2 (75-84% HR_{peak}), zone 3 (85-89% HR_{peak}), and zone 4 (>90% HR_{peak}) (17).

Time-motion characteristics

Each player wore a portable global positioning system (GPS) unit (VX Sport 220, Visuallex Sport International, Wellington, New Zealand) to determine time-motion characteristics during all SSGs. The GPS system sampled at 4 Hz and provided speed and distance data. Speed data was classified into 4 zones: walking (0 – 6.9 $km \cdot hr^{-1}$), jogging (7 – 12.9 $km \cdot hr^{-1}$), cruising (13 –

17.9 km·hr^{-1}), and sprinting (>18 km·hr^{-1}) (23). GPS technology measuring at a frequency of 5Hz has been shown to offer a valid and reliable way of measuring distance and movement speed by players involved in team sports (27).

Psychophysical variables

Ratings of perceived exertion (RPE) were determined using the 6-20 linear Borg scale (3) at the completion of each SSG. Players were asked to base their perceived exertion on the entire game rather than at the time of rating. The typical error of RPE for SSGs has been shown to be 1-2 units (19).

Technical skill executions

All SSGs were recorded using a high-speed digital video camera (Cannon G11). Post-game notation analysis was undertaken to determine each player's skill executions during each game. The following executions were quantified by an experienced technical analyst: number of possessions, number of catches and passes, successful and unsuccessful catches and passes, and goals scored. A successful pass was defined as one that was either caught or able to be caught by a player on the same team as the player who made the pass.

Statistical Analyses

Data are presented as means ± SD. To make assumptions about true (population) values of the effect of different small sided games formats on physiological variables, time-motion characteristics and skill executions, the uncertainty of the effect was expressed as 90% confidence limits and as likelihoods that the true value of the effect represents substantial change. An effect was deemed unclear if its confidence interval overlapped the thresholds for substantiveness, meaning that the effect could be substantially positive and negative. The chances that the true (population) differences are substantial were assessed using 0.2 standardised units (change in mean divided by the between subject SD) and expressed as both percentages and qualitatively, using practical inferences (25).

RESULTS

Physical and perceptual characteristics

Table 2 shows HR response, time spent in different heart rate zones and RPE during bucketball. A likely substantial true difference in $\%HR_{peak}$ was shown between the 3 vs. 3 and 4 vs. 4 games (86%) as well as between the 3 vs. 3 and 6 vs. 6 games (92%). A likely substantial true difference was also shown in time spent above 90% HR_{peak} between 3 vs. 3 and 4 vs. 4, and 3 vs. 3 and 6 vs. 6 games (85% and 88%, respectively). There was no difference between the various bucketball game formats for RPE (Table 2).

Time-motion characteristics

Table 2 shows the distance travelled at different speed zones during bucketball. There was no true difference between the various bucketball game formats for total distance (TD). Total distance travelled at 13 – 17.9 $km \cdot hr^{-1}$ was greater during 6 vs. 6 than 3 vs. 3 games (very likely substantial true difference, 97%). Total distance above 18 $km \cdot hr^{-1}$ was less during 3 vs. 3 than both 6 vs. 6 (likely substantial true difference, 92%) and 4 vs. 4 games (likely substantial true difference, 81%). There was also a tendency for players to travel more of their TD at 0 – 6.9 $km \cdot hr^{-1}$ during 3 vs. 3 compared to 4 vs. 4 games (89%, Table 2).

Technical Outputs

Table 3 shows the technical outputs completed during three different formats of bucketball. Total possessions and number of catches, passes and shots were all higher in 3 vs. 3 compared with 4 vs. 4 and 6 vs. 6 games. The number of successful passes and catches was not different between games, however 3 vs. 3 allowed for more successful shots than 6 vs. 6 games (very likely substantial true difference, 96%, Table 3).

DISCUSSION

Small-sided games are commonly used as a specific training modality for enhancing aerobic fitness in a variety of team sport players (4, 26). Recent evidence indicates that by manipulating game variables to achieve appropriate overload, successful adaptation can occur (4, 22, 26). However the majority of research to date has used youth (14 – 18 years) (5, 6, 10, 12, 20, 22, 23, 30, 33) or adult (11, 13, 14, 24, 31, 34) populations, and soccer as the main sport (5, 6, 8, 10, 11, 20-24, 29-31, 33, 34). Consequently, little is known about other types of SSG formats that best suit younger athletes (<14 years) and who may participate in a variety of sports involving upper and lower body skills. Hence, the main objective of this study was to quantify the physiological responses and time-motion characteristics associated with a non sport-specific SSG in young team sport players. The main finding of this study was that bucketball produced a high level of physiological stimulus, and therefore may be useful to train aerobic fitness in young athletes. In addition, when player numbers were increased, with a relative increase in player area, a greater effect was seen on physiological workloads than on either time-motion characteristics or perceptual response.

Physiological and Perceptual Responses

This study examined three different formats of a non sport-specific SSG in young athletes aged at their peak height velocity. Heart rate intensities found in the present study were similar to previous studies examining 3 vs. 3 SSGs in soccer players (9, 11, 28, 30, 31, 34). The mean percent HR_{peak} responses during 3 vs. 3 bucketball were larger than both 4 vs. 4 and 6 vs. 6 game formats (Table 2). In addition, a likely substantial true difference was shown in time spent above 90% HR_{peak} between 3 vs. 3 and 4 vs. 4, and 3 vs. 3 and 6 vs. 6 games (85% and 88%, respectively). A likely explanation for the difference in heart rate response between the three bucketball SSG formats was the occurrence of a greater number of ball possessions and greater overall individual involvement when player numbers were reduced (Table 3). Indeed, it has been previously shown that time in possession increases energy expenditure compared to running without the ball in soccer players (35). This effect is consistent with previous research examining the effect of altering player number, relative to playing area, on SSG training intensity in youth and adult soccer and rugby league (12, 22, 31, 34). Since high heart rates are important for improving aerobic fitness during training (18, 24), these findings indicate that fewer player numbers during a non sport-specific SSG may be more suitable for successful aerobic fitness adaptation in young athletes.

We observed no difference in percent HR_{peak} between the 4 vs. 4 and 6 vs. 6 bucketball SSGs (Table 2). This finding concurs with one previous study examining SSGs in young rugby league players (12), but disagrees with the results of previous research investigating altering player number during SSGs in older athletes (12, 22). This finding may reflect a difference in tactical ability between young and more experienced older players. Inferior tactical awareness by young players may cause them to self-restrict the area in which they work and focus too intently on the ball rather than the events occurring elsewhere associated with getting free. Accordingly, higher numbers of players all looking for the ball at once is likely to reduce player movement and subsequent game intensity. With experience, increased tactical awareness may in fact negate this issue as the ability to move effectively off the ball and find space to receive a pass may improve.

Ratings of perceived exertion are considered a good global indicator of exercise intensity when compared with HR during game-specific exercise in adolescent and adult players (22, 34) and have be shown to be highest with decreasing numbers of players in SSGs

(22, 30, 34). However, the present study reports similar RPE across all bucketball SSG formats (Table 2), demonstrating that perception of effort by young athletes during SGGs is not influenced by player number and may therefore not be an accurate indicator of game intensity in this age group. It is possible that young athletes do not have the necessary experience to distinguish between relatively small changes in exercise intensity during SSGs.

Time-motion characteristics

The GPS data from this study demonstrate that despite no apparent difference in total distance travelled between game formats, there was a likely chance (89%) that players travelled more total distance at 0 – 6.9 km·hr^{-1} in the 3 vs. 3 compared to 4 vs. 4 game format. Moreover, players travelled less total distance at higher running speeds (i.e. above 13 km·hr^{-1}) during the 3 vs. 3 format compared to 4 vs. 4 and 6 vs. 6 games (Table 2). Similar results have been demonstrated when 2 vs. 2 and 4 vs. 4 SSGs in adolescent soccer players were compared (22). These authors reported a significant difference in distance travelled at 0 – 6.9 km·hr^{-1} between the two game formats and suggested less absolute pitch space available for high speed running as a possible contributing factor to their findings. It has also been suggested that increased possession during SSGs, resulting from less players involved, requires players to slow down their running speeds for better control of technical outputs (22, 33). Indeed, the present study provides further evidence for this by demonstrating that greater distance travelled at lower speeds during 3 vs. 3 compared to 4 vs. 4 and 6 vs. 6 games may have resulted from the higher technical output required. Individual possessions, passes and shots were all higher in 3 vs. 3 compared to 4 vs. 4 and 6 vs. 6 games (Table 3) and therefore players may have had to slow their movement down for better control of the ball.

Technical Outputs

This is the first study to examine the effect of varying playing number on technical outputs during a non sport-specific SSG in young athletes. The results indicate that technical outputs were reduced as player number increased. More specifically, the number of possessions, passes, catches and shots were higher during 3 vs. 3 bucketball compared to 4 vs. 4 and 6 vs. 6 (Table 3). This result agreed with previous studies investigating soccer SSGs that reported similar findings (5, 9, 28, 33). However, the specific skills involved in a catch and pass game compared with soccer are considerably different, and therefore comparisons are difficult to make. In the present study, more time was spent by players “off the ball” during the 4 vs. 4 and 6 vs. 6 games. Players would therefore be required to work harder while not in possession to lose their marker and create passing opportunities for their team mates. This can be achieved effectively by alternating between very slow movements and high speed runs over sustained distances. Indeed, this tactic may have been employed by the players in the present study and contributed to the differences in time-motion characteristics we observed.

In summary, to our knowledge this is the first study to report the physiological, time-motion and technical responses of a non sport-specific SSG in young team sport players. This study demonstrated that a ‘general’ catch and pass SSG can elicit sufficient training stimulus to potentially improve aerobic fitness in young athletes. There was a tendency for the smaller team game format (3 vs. 3) to elicit greater physiological responses than larger teams. Finally, games with fewer players induced more physical and technical outputs than larger teams.

PRACTICAL APPLICATIONS

It is important for coaches and sport scientists working with team sports to understand how to manipulate SSG variables to achieve a desired physical or technical adaptation. Based on the results presented in this study, we recommend that coaches of young (<14 years) team sport players consider the addition of an non sport-specific 3 vs. 3 SSG to their training regime for the purpose of increasing aerobic fitness. Given that a catch and pass game incorporates fundamental skills, it may be considered as a useful training tool by coaches in a wide range of team sports. For players involved in sports during which possession is controlled with the hands, it will not only provide an opportunity to improve aerobic fitness but develop technical game skills (including passing, catching, and shooting) at the same time. Furthermore, it may also provide benefits to young players involved in sports where game intensity is reliant on a reasonably high level of skill to maintain control of the ball (e.g. soccer, hockey). For these sports, a non sport-specific catch and pass SSG may be adopted during specific training phases for the purpose of increasing aerobic fitness.

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TABLES

Table 1 – Summary of small-sided games and formats

	Bucketball		
Rules	• No goalkeepers • Game is played with a size 4 handball • Unlimited number of steps with ball • Ball can be 'stolen' from players hands • Possession lost when ball is dropped, goes out of play or a bucket is scored		
Variables			
Player number	3 vs. 3	4 vs. 4	6 vs. 6
Game duration (min)	16 continuous		
Playing area size (m)	25 x 35	30 x 40	35 x 49
Bucket size (h x d) (cm)	47 x 41		
Bucket circle (r) (cm)	200		

Table 2 – Physiological and perceptual responses, and time-motion characteristics during SSGs

	Game Format		Difference; ±90% CL	Effect size; ±90% CL	Chances that the true differences are substantial*		Game Format		Difference; ±90% CL	Effect size; ±90% CL	Chances that the true differences are substantial*		Game Format		Difference; ±90% CL	Effect size; ±90% CL	Chances that the true differences are substantial*	
	3 vs. 3	4 vs. 4			%	Qualitative	3 vs. 3	6 vs. 6			%	Qualitative	4 vs. 4	6 vs. 6			%	Qualitative
$\%HR_{peak}$ (bpm)	88.3 ± 4.3	85.9 ± 4.9	-2.4; ±2.4	-0.53; ±0.54	86	Likely	88.3 ± 4.3	85.9 ± 3.2	-2.5; ±1.9	-0.54; ±0.42	92	Likely	85.9 ± 4.9	85.9 ± 3.2	0.0; ±1.9	-0.01; ±0.42	22	Unlikely
TD (m)	1414 ± 98	1429 ± 147	15.5; ±63.0	0.11; ±0.43	35	Possibly	1414 ± 98	1427 ± 106	13.6; ±49.6	0.09; ±0.34	29	Possibly	1429 ± 147	1427 ± 106	-1.9; ±65.3	-0.01; ±0.44	23	Unlikely
TD at 0 – 6.9 km·hr^{-1} (m)	678 ± 73	639 ± 55	-38.6 ±35.3	-0.61; ±0.56	89	Likely	678 ± 73	655 ± 43	15.8; ±31.4	-0.36; ±0.58	57	Possibly	639 ± 55	655 ± 43	-22.8; ±36.9	0.25; ±0.50	69	Possibly
TD at 7 – 12.9 km·hr^{-1} (m)	585 ± 80	580 ± 104	-5.2: ±43.5	-0.05; ±0.42	27	Possibly	585 ± 80	544 ± 62	-41.9; ±33.7	-0.40; ±0.32	86	Likely	580 ± 104	544 ± 62	-36.7; ±39.0	-0.35; ±0.37	76	Likely
TD at 13 – 17.9 km·hr^{-1} (m)	137 ± 65	188 ± 90	51.0; ±43.4	0.63; ±0.54	91	Likely	137 ± 65	195 ± 89	58.4; ±36.9	0.72; ±0.46	97	Very Likely	188 ± 90	195 ± 89	7.4; ±40.2	0.09; ±0.50	16	Unlikely
TD at > 18 km·hr^{-1} (m)	11 ± 15	21 ± 28	10.2; ±8.7	0.35; ±0.30	81	Likely	11 ± 15	34 ± 45	23.3; ±20.6	0.80; ±0.71	92	Likely	21 ± 28	34 ± 45	13.1; ±22.6	0.45; ±0.78	71	Possibly
Time spent below 75% HR_{max} (s)	40 ± 99	75 ± 87	35.4; ±36.9	0.27; ±0.28	67	Possibly	40 ± 99	54 ± 65	14.7; ±36.3	0.11; ±0.28	67	Possibly	75 ± 87	54 ± 65	-20.8; ±37.5	-0.16; ±0.29	57	Possibly
Time spent at 75 - 84% HR_{max} (s)	185 ± 184	295 ± 221	109.3; ±118	0.56; ±0.60	85	Likely	185 ± 184	265 ± 192	79.9; ±72.0	0.41; ±0.37	83	Likely	295 ± 221	265 ± 192	-29.6; ±106.0	-0.15; ±0.54	44	Possibly
Time spent at 85 - 89% HR_{max} (s)	233 ± 146	236 ± 90	3.2; ±85.6	0.03; ±0.67	32	Possibly	233 ± 146	267 ± 83	34.0; ±92.7	0.27; ±0.74	57	Possibly	236 ± 90	267 ± 83	30.8; ±52.4	0.24; ±0.42	57	Possibly
Time spent above 90% HR_{max} (s)	503 ± 309	356 ± 314	-148.1; ±153.9	-0.53; ±0.55	85	Likely	503 ± 309	370 ± 223	-132.7; ±112.2	-0.48; ±0.40	88	Likely	356 ± 314	370 ± 223	14.4; ±114.5	0.05; ±0.41	27	Possibly
RPE	15.2 ± 1.2	15.0 ± 0.9	-0.3; ±0.9	-0.19; ±0.64	49	Possibly	15.2 ± 1.2	14.8 ± 0.9	-0.5; ±0.9	-0.35; ±0.65	65	Possibly	15.0 ± 0.9	14.8 ± 0.9	-0.2; ±0.2	-0.16; ±0.18	34	Possibly

HR = heart rate; TD = total distance; RPE = rating of perceived exertion

Table 3 - Technical skill executions during SSGs

Technical skill	3 vs. 3	4 vs. 4	6 vs. 6
Total possessions	25.5 ± 7.8	16.2 ± 4.9[a]	14.7 ± 5.2[a]
Total catches	21.3 ± 5.4	13.6 ± 4.1[a]	14.6 ± 5.0[c]
Successful catches (%)	93.5 ± 11.6	96.3 ± 4.1	95.6 ± 6.1
Total passes	17.8 ± 6.6	12.9 ± 4.3[c]	11.7 ± 5.0[c]
Successful passes (%)	89.3 ± 7.5	83.6 ± 10.6	84.3 ± 12.3
Total shots	7.0 ± 2.8	2.7 ± 2.5[a]	2.7 ± 2.0[a]
Successful shots (%)	54.7 ± 19.9	39.4 ± 23.1	31.4 ± 33.1[c]

[a] = Most likely substantial true difference from 3 vs. 3

[c] = Very likely substantial true difference from 3 vs. 3

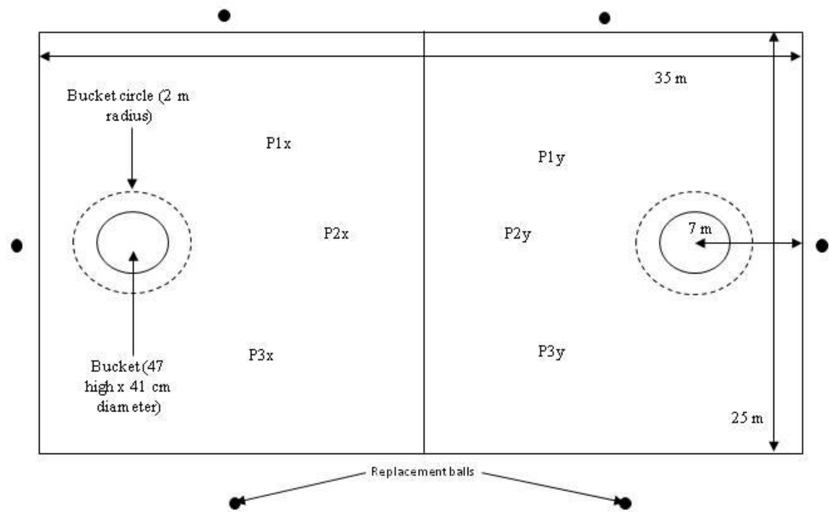

Figure 1 - Bucketball set-up and play dimensions for 3 vs. 3 format