

Original Research

Activity Profile Differences Between Sub-elite Futsal Teams

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ABSTRACT

International Journal of Exercise Science 8(2) : 112-123, 2015. Whilst there are a range of studies examining the differences in match demands between levels of competition, there is an absence of the analysis these differences between teams within the same level of competition. The study used notational analysis to identify performance indicators that differentiated between sub-elite futsal teams from Brazil, Spain and Australia during regular season matches. Based on world rankings, Spanish and Brazilian futsal was deemed to be superior to Australian futsal. The Australian players spent a significantly greater time engaged in high intensity activity than the Spanish players (sprinting: 0.36% v. 0.06%, $p < 0.05$); running: 5.89% v. 3.33%). The Brazilian team displayed the greatest possession of the ball ($40.0 \pm 10.4\%$) when compared to the Spanish ($23.5 \pm 2.73\%$) and Australian teams ($30.9 \pm 2.54\%$) ($p < 0.01$). Additionally, the Brazilian and Spanish teams made a greater number of successful passes per minute of match-play than the Australian team (10.7 ± 1.06 v. 8.68 ± 0.81 v. 5.31 ± 0.60 , respectively, $p < 0.01$). These results generally suggest that lower high intensity activity output and superior ball possession and passing accuracy appear to be critical determinants in discriminating between successful and unsuccessful match performance. Accordingly, training to improve technical and decision making skills, specifically related to maintaining ball possession and improving passing accuracy, will likely assist lower performing teams.

KEY WORDS: Indoor soccer, time-motion analysis, movement demands, player tracking, team sport

INTRODUCTION

Futsal (5-a-side indoor soccer) is a popular sport with over 30 million players in over 100 countries (5, 17). The sport is intermittent in nature, comprised of short duration maximal and sub-maximal high-intensity work periods, randomly alternating with long periods of low-intensity activity (4, 25, 29). Futsal players have been known to cover a distance of anywhere between 2.5 – 4.3 km throughout

a match, equating to movement rates of between 94.5 – 121 m min⁻¹ (3, 4, 8, 13).

There has been recent growth in the number of studies published on futsal with the majority focusing on match analysis and physiological responses during match play (3, 8, 13, 27, 29). However, none of these studies have examined the differences in technical skills between relatively low performing teams and relatively high performing teams of the same playing level.

The examination of the differences between such teams will provide a greater understanding of the skill requirements during match-play, as demonstrated in previous team sport studies where ball specific skill differences have been identified between high-calibre and low-calibre teams (22). This is of particular importance for lower performing teams who may benefit from several practical applications, such as optimising training programs and providing information on areas requiring improvement (4, 7, 14, 29).

The current study, therefore, aimed to investigate the differences in match demands between three sub-elite futsal teams that participate in the domestic competitions of nations that compete at the Futsal World Championships, in order to detect any performance indicators which may differ between the teams. These teams were from Spain, Brazil and Australia. The study also aimed to detect performance indicators which differed between the teams, such as ball possession characteristics and shooting success. Based on world rankings at the time of testing, Spanish (ranked 1st) and Brazilian (ranked 2nd) futsal was deemed to be superior to Australian futsal (ranked 25th) (19). It was hypothesised that there would be a greater ball possession percentage and a greater success rate of passes and shots on goal for the Brazilian and Spanish teams when compared to the Australian team, despite being at the same relative level of competition. Additionally, as previous studies have demonstrated that more successful teams cover less distance in high-intensity running when compared to less successful teams (10, 22, 28), similar outcomes were expected in this study. The analysis and interpretation of the data may

provide coaches with a greater understanding of movement demands from a variety of nations with established domestic competitions. Such an understanding can be used to alter training programs to potentially improve the performance of poorer performing nations (6). The data may also provide a greater understanding of the influence of fatigue on the expression of technical skills, which may be relevant to other court sports such as basketball, handball or volleyball.

METHODS

Participants

One futsal team from Australia, one futsal team from Brazil and one futsal team from Spain were used for this study. All teams were of an equivalent competition standard in their respective countries as they were at a level of play where players could be selected to represent their country in futsal. Details of each team are as follows:

Australia (low performing team): A team consisting of 13 male athletes (20.3 ± 1.15 yr, 176.7 ± 8.50 cm, 74.7 ± 4.04 kg) participated in this study. Four matches from the Football NSW Futsal Premier League competition involving the team were used for analysis.

Brazil (high performing team): A team consisting of 15 male athletes (21.0 ± 3.6 yr, 175.0 ± 4.90 m, 73.3 ± 8.5 kg) participated in this study. Four matches from the Regional and Micro-regional phases of the Jogos Abertos de Santa Catarina involving the team were used for analysis.

Spain (high performing team): A team consisting of 11 male athletes (25.1 ± 4.32 yr, 175.1 ± 5.54 cm, 70.5 ± 6.90 kg) participated

in this study. Five matches from the División de Plata Norte of la Liga Nacional de Fútbol Sala (National Futsal League, Silver Division, North) involving the team were used for analysis.

The coach and players of all teams were informed of the purposes of the study and written informed consent was obtained from the coach or manager of each team prior to participating in the study. Criteria for inclusion in the study were: being selected to play by the coach and being free from injury or illness. Exclusion criteria included being injured or ill, or not being selected to play by the coach. The Human Research Ethics Committee at the University of Technology, Sydney approved the methodology and procedures used in this study.

Protocol

In order to assess the differences in match performance, an observational study was carried out, where the futsal players participated in their regular season matches with data obtained by means of video recording. This enabled a comparison of notational analysis results between the high performing and the low performing teams, with individual player and team movement activity and match activity profiles observed. Due to location and technical constraints, data was gathered for four games for the Australian and Brazilian teams, and five games for the Spanish team. Further, only team data could be obtained for the Brazilian team, therefore individual player analysis could not be undertaken.

For each match assessed, movement activities, ball possession and match activities were monitored by means of video recording. Two digital video cameras

(Panasonic, Osaka, Japan) were set up, both equipped with a fish-eye (ultra-wide angle) lens, allowing each camera to cover one-half of the futsal court. All matches were played on futsal courts with dimensions complying with FIFA rules (38–42m length x 20–25m width) (16). As matches were played at various venues, the camera set up could not be standardised, however, where possible, the cameras were placed 10 m away from the sideline, approximately 2 m either side of the half-way line, and 10 m from ground level on the sideline of the court. Both cameras were set up on tripods 1.5 m high and angled inward, consequentially providing a camera height of 11.5 m above the playing surface.

All teams were tracked during the entire match-play from kick-off until full-time, with the exceptions of time-outs and half-time periods. It should be noted that the time-keeping for the matches involving the Australian team did not account for stop-time, therefore, the match time included all breaks in play except half-time and time-outs, resulting in a 40 minute total match time. In contrast, the matches involving the Brazilian and Spanish teams used stop-time, therefore, the matches were up to 90 minutes in duration. Accordingly, the majority of the data analysis where comparisons between teams occurred was undertaken using data which was transformed into relative percentages of total match-play. Due to location and technical difficulties, individual player data could not be obtained for the Brazilian team, therefore only team data was analysed.

As two cameras recorded the matches, two television sets were required for analysis. The television sets were placed side by side,

Table 1. Match activities and their definitions.

Match Activity	Definition
Pass	the motion made where the ball was transferred from one player to another with the inside or outside of the foot, with the ball often travelling on the ground
Kick	a motion stronger than a pass where the ball was struck with the toe, the superior part of the toes, or the inside of the foot near the first toe, with the ball often travelling in the air
Successful Pass	any pass made which reached its intended target
Unsuccessful Pass	any pass made which did not reach its intended target, for example, the pass was intercepted or blocked by an opponent, or travelled out of the playing area
Successful Kick	any kick made which reached its intended target
Unsuccessful Kick	any kick made which did not reach its intended target, for example, the kick was intercepted or blocked by an opponent, or travelled out of the playing area
Clearance Kick	any kick made which was intended to clear the zone or court
Shots on Goal	an intentional shot towards the goal where if the goal was empty, would result in a goal
Shots off Goal	an intentional shot towards the goal where if the goal net was empty, would not result in a goal

and the matches were played and timed to allow the game to be viewed as it was played. A computer program designed to track player movement and activities was used for this study, after having established its reliability and validity (10.4% and 1.7% typical error of measurement for total distance covered and total duration of activities, respectively, between two trials of notational analysis) (12). Systemic bias was also previously assessed for each variable using a paired t-test, with no differences evident between test occasions. The identification of the speed of each movement category was based on the researcher's subjective judgement, with the velocities and descriptions of activities selected from the methodologies of several researchers in various team sports (4, 14, 31). As the computer program was unable to categorise speed ranges, an estimate speed for each category was established in order to analyse movement demands. These were as follows: standing (0 m s^{-1}), walking (1 m s^{-1}), jogging (3 m s^{-1}), running

(5 m s^{-1}), sprinting (7 m s^{-1}) and sideways/backwards jogging (3 m s^{-1}) which included jockeying an opposing player. These activities were later divided into either low-intensity activity (LIA) (those under 5 m s^{-1} including standing, walking, jogging and sideways/backwards jogging), and high-intensity activity (HIA) (those at or over 5 m s^{-1} including running and sprinting). Each movement activity was timed to 0.1 s and the total duration for each activity was calculated. The total distance covered in each movement activity was estimated using the total duration of each activity by the speed assigned to it. Total frequency of activities was also computed. The raw (absolute) values were then converted into relative (percentage) values by dividing the number of minutes of match-play per player. This enabled a standardised comparison between matches with different timing methods (11).

An analysis of ball possession was also undertaken, with team ball possession

(analysed team had complete control of the ball), opposition possession (opposing team had complete control), loose/free ball (no clear possession) and ball out of play (ball was outside playing area including breaks in play) being assessed. Each variable was timed to 0.1 s enabling the calculation of the total duration for each variable. The frequency or the number of times the ball possession changed was also calculated. As with the movement activities, the ball possession was also converted into relative data to enable a standardised comparison between the three teams.

In addition to the above, match activities were analysed for the three teams, as reported by several researchers (1, 2, 20, 26) such as passing and shooting success. The definition of these activities is presented in Table 1. The match activities were recorded as the number of occurrences per player for the entire match (Australian and Spanish teams), as well as for the entire team (Australian, Spanish and Brazilian teams), which were then divided by the total minutes played, to give a frequency of activity occurrence per minute of match-play and provide a standardised comparison. One trained and experienced researcher performed all of the analysis, thereby minimising any inter-individual variation in the measures.

Statistical Analysis

All results were collated and various statistical procedures implemented using Statistical Package for Social Sciences (SPSS, version 16.0). Each set of data was tested for normality using a Shapiro-Wilks test and for homogeneity of variance using Levene's test. All data was normally distributed, therefore, one-way ANOVA's were conducted on the relative values for the

distance, duration and frequency variables, as well as the match activities, and ball possession data to determine any differences in measurements between the teams. Bonferroni Post-Hoc tests were conducted on any significantly different data to determine between which teams the difference occurred. Due to the evident timing differences, statistical analysis was not conducted on raw data. An alpha level of $p < 0.05$ was selected as the criterion for significance for all statistical procedures, with descriptive statistics for all variables reported as mean \pm standard deviation (SD). To maximise reliability, the same researcher performed all of the match analyses.

RESULTS

A total of 13 players were analysed from Australia over 4 matches, 15 players over 4 matches in Brazil, and 11 players over 5 matches in Spain. The matches produced the following results:

Australia: 2-2 draw; 4-1 win; 3-3 draw; 7-1 loss.

Brazil: 5-3 loss; 1-0 win; 6-4 win; 3-0 loss.

Spain: 3-0 loss; 5-1 win; 3-2 loss; 2-1 win; 3-3 draw.

The average match time was 2402.4 ± 0.57 s (40 min) for the Australian matches, 3270.5 ± 514.0 s (55 min) for the Brazilian matches and 4457.5 ± 91.4 s (74 min) for the Spanish matches.

An analysis on the movement activities was conducted on the Australian and Spanish players. The average duration an Australian player participated in a match was 1501.1 ± 504.4 s (25 min) of running clock-time, which was 36% less than that

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played by the average Spanish player of 2346.3 ± 931.2 s (39 min) in stop-time.

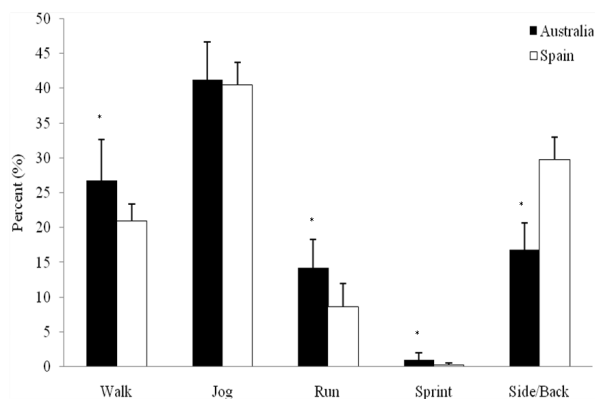


Figure 1. Mean total relative distance covered for movement activities for Australian and Spanish futsal players (error bars are standard deviation). * Significantly different from the Spanish players ($p < 0.05$).

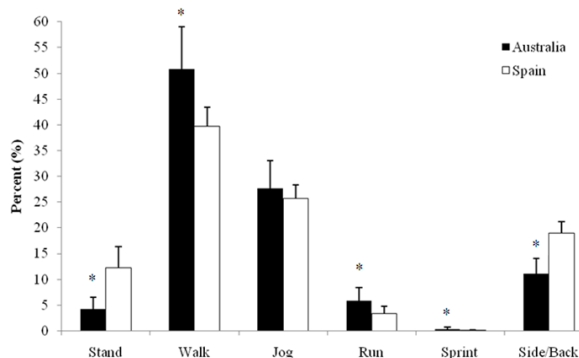


Figure 2. Mean total relative duration spent in movement activities for Australian and Spanish futsal players (error bars are standard deviation). * Significantly different from the Spanish players ($p < 0.05$).

The average total distance covered in a match for the Australian players was 2766.6 ± 943.0 m and was 4488.5 ± 1806.6 m for the Spanish players. The average match speed for the Australian players equated to 100.6 ± 37.8 m min^{-1} (1.84 ± 0.63 m s^{-1}), and was 114.8 ± 46.2 m min^{-1} (1.91 ± 0.77 m s^{-1}) for the Spanish team. The analysis of the relative values for distance covered in movement activities revealed significant

differences between the teams, as displayed in Figure 1, with relative duration values displayed in Figure 2.

Match activity analysis was conducted on the Australian, Brazilian and Spanish teams. The total relative frequency and duration of ball possession data for all teams is presented in Table 2. It was observed that the Brazilian team produced the lowest frequency of a loose/free ball during the matches ($p < 0.01$), as well as the greatest possession of the ball when compared to the Spanish and Australian teams ($p < 0.01$). The Australian team reported a greater duration of a loose/free ball during the matches ($p < 0.01$) when compared to the Brazilian and Spanish teams.

Total match activity data for all teams is presented in Table 3. From this data, passing and shooting accuracy as well as goal conversion was calculated, however, given the differences in timing, no statistical analysis was conducted on this data. The Brazilian team revealed the best passing accuracy with 93.1% of all passes being successful, compared to 89.9% for the Spanish team and 87.4% for the Australian team. The Brazilian team recorded the best shot accuracy with 47.6% of all shots taken being on goal. The Spanish team had a 45.3% shot accuracy and the Australian team had a 46.4% shot accuracy.

When the data was adjusted to frequency of match activities per minute of match-play, several significant differences were found between the teams, as demonstrated in Table 3. The Brazilian team performed the greatest number of successful passes per minute of match-play ($p < 0.01$). The Brazilian team also performed the greatest

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Table 2. Relative ball possession frequency and duration for the teams (%) (mean \pm standard deviation). *Significantly different from the Australian team ($p<0.05$). † Significantly different from the Spanish team ($p<0.05$).

		Team Possession	Opposition Possession	Loose/Free Ball	Ball Out Of Play
Frequency (%)	Australia	27.0 \pm 2.96	28.1 \pm 0.64	17.8 \pm 1.75	27.1 \pm 1.58
	Brazil	20.5 \pm 11.8	22.2 \pm 9.99	9.42 \pm 4.81 [†]	47.9 \pm 26.5
	Spain	23.7 \pm 0.79	26.9 \pm 1.21	17.7 \pm 1.63	31.8 \pm 0.74
Duration (%)	Australia	30.9 \pm 2.54	25.6 \pm 3.43	5.57 \pm 0.76 [†]	37.9 \pm 1.07
	Brazil	40.0 \pm 10.4 [†]	32.1 \pm 7.32	2.89 \pm 0.58 [†]	25.0 \pm 13.7 [†]
	Spanish	23.5 \pm 2.73	26.7 \pm 3.44	3.95 \pm 0.57*	45.9 \pm 0.85

Table 3. Match activity data for all teams (mean \pm standard deviation). Statistical analysis not performed on values for entire match duration. * Significantly different from the Spanish team ($p<0.05$). † Significantly different from the Brazilian team ($p<0.05$).

	Values for entire match duration			Values relative to minutes of match-play		
	Australia	Brazil	Spain	Australia	Brazil	Spain
Successful Pass	212.3 \pm 24.0	428.8 \pm 58.5	347.2 \pm 59.7	5.31 \pm 0.60 [†]	10.7 \pm 1.06	8.68 \pm 0.81
Unsuccessful Pass	30.5 \pm 7.72	32.0 \pm 5.42	39.0 \pm 6.86	0.76 \pm 0.19	0.8 \pm 0.10	0.98 \pm 0.09
Successful Kick	14.4 \pm 1.26	28.75 \pm 3.59	36.6 \pm 3.39	0.36 \pm 0.03 [†]	0.72 \pm 0.07	0.92 \pm 0.05
Unsuccessful Kick	16.3 \pm 1.41	20.3 \pm 2.63	29.7 \pm 4.85	0.41 \pm 0.04*	0.51 \pm 0.05	0.74 \pm 0.07
Clearance Kick	13.0 \pm 2.22	8.50 \pm 1.00	26.4 \pm 6.35	0.33 \pm 0.06*	0.21 \pm 0.02*	0.66 \pm 0.09 [†]
Shot on Goal	25.1 \pm 2.71	29.3 \pm 8.96	22.0 \pm 2.55	0.63 \pm 0.07	0.73 \pm 0.16*	0.55 \pm 0.03
Shot off Goal	29.0 \pm 5.26	32.3 \pm 4.57	26.6 \pm 4.15	0.73 \pm 0.13	0.81 \pm 0.08*	0.67 \pm 0.06

Table 4. Match activity data for the Australian and Spanish teams presented as raw data and relative to match playing time (mean \pm standard deviation). Statistical analysis not performed on raw match data. * Significantly different from the Spanish players ($p<0.05$).

	Raw Match Data		Number of Activities per Minute	
	Australia	Spain	Australia	Spain
Successful Pass	28.0 \pm 12.9	40.3 \pm 23.4	1.12 \pm 0.51	1.03 \pm 0.60
Unsuccessful Pass	3.96 \pm 2.64	4.65 \pm 3.76	0.16 \pm 0.11	0.12 \pm 0.10
Successful Kick	1.11 \pm 0.33	3.33 \pm 3.68	0.04 \pm 0.01*	0.09 \pm 0.09
Unsuccessful Kick	1.25 \pm 0.45	2.70 \pm 2.24	0.05 \pm 0.02*	0.07 \pm 0.06
Clearance Kick	1.00 \pm 0.00	2.40 \pm 1.54	0.04 \pm 0.00*	0.06 \pm 0.04
Total Touches	101.7 \pm 48.6	129.9 \pm 70.1	4.06 \pm 1.94	3.32 \pm 1.79
Shot On Goal	2.70 \pm 1.72	2.00 \pm 1.00	0.11 \pm 0.07*	0.05 \pm 0.03
Shot Off Goal	3.00 \pm 1.89	2.42 \pm 1.63	0.12 \pm 0.08	0.06 \pm 0.04

number of shots on goal per minute of match-play ($p=0.02$) and shots off goal ($p=0.03$).

Furthermore, individual player data from the Australian and Spanish teams was analysed, with this data displayed in Table

4. When the data was examined relative to match time and expressed as number of activities performed per minute of match-play, several significant differences were observed.

DISCUSSION

Several team sport studies have examined the physiological and match-play differences between teams of different playing levels (13, 18, 22, 30, 32), which has provided specific information for the lower level team to improve match performance. However, to date, no previous study has examined the differences in match demands between teams of varying international success at the same playing level. This study quantified the movement patterns, match activities and ball possession characteristics of futsal players during competition and examined the differences in match-play of Australian, Brazilian and Spanish futsal teams of an equivalent level. Specifically, the study was designed to identify performance indicators that differentiated between the relatively high performing futsal nations (Brazil and Spain) and a relatively low performing futsal nation (Australia) in an applied setting.

The Australian players played an average of 1501 s per match (62.5% of the total match time), and the Spanish players played an average of 2346 s per match (52.6% of the total match time) with the differences in raw magnitudes between the teams due to the timing differences. These figures tended to be within the range reported in previous futsal studies of 1873 – 2587 s or 38 – 56% of the total match time (3, 4, 27). The average total distance covered by the Australian players was 2767 m, with

4489 m travelled per match for the Spanish players. Whilst the total distance covered by the Australian players was within the distances reported in previous futsal studies of 2575 – 4313 m (3, 4, 13), the total distance covered by the Spanish players was marginally higher than other studies, and higher than the Australian players. The difference in distance values between the Australian and Spanish players is largely due to the different time-keeping methods at the same level of competition. This is a particularly important issue for Australian players preparing for international competitions where stop-time is used, as it has been previously suggested that players involved in a longer match duration will perform a greater number of efforts and therefore cover a greater distance (3). As such, Australian futsal players may be inadequately conditioned for international matches, and training methods may need to be altered to account for the greater aerobic demands, and potentially a different tactical approach to the game to delay the onset of fatigue.

The Australian players covered a significantly greater relative sprinting distance, and running distance than the Spanish players (sprinting: 1.07% v. 0.20%; running: 14.2% v. 8.59%), with some Spanish players not sprinting at all during the matches (Figure 1). Additionally, both teams spent a small proportion of the matches engaged in HIA, with the Australian players spending a significantly greater relative duration sprinting and running than the Spanish players (sprinting: 0.36% v. 0.06%; running: 5.89% v. 3.33%). The relative sprinting duration was less than that reported in previous futsal studies of between 1 – 8% (4, 8, 13). Such differences may be attributed to the

skill level and choice of tactics made by the players analysed as well as the method of notational analysis and interpretation of velocities, where it has been demonstrated that when small distances are observed, such as with sprinting, relatively large errors are produced (15). Despite this, the results of the current study are supported by previous studies, which have demonstrated that more successful teams cover less distance in high-intensity running when compared to less successful teams (10, 22, 28).

When compared to the Spanish players, the Australian players covered a greater relative distance in all movement activities, except for sideways/backwards jogging. This suggests that the Spanish players' choice of movements allows them to track the game with greater patience. Further, this player behaviour may also allow them to reduce the need to sprint and risk being caught out of position. By jogging sideways or backwards, players are facing the play rather than having their back turned to the ball, which assists with tracking the game. Additionally, by performing a greater proportion of sprinting, this potentially led to the Australian players being fatigued and perhaps performing fatigue-related errors, which have a negative effect on player and team performance (28).

The analysis of ball possession was undertaken to identify any patterns occurring between the high performing teams when compared to the low performing team. When expressed as values relative to total match-time, the Brazilian team recorded the greatest possession of the ball over the total match-time (40%), when compared to the Australian team (31%) and the Spanish

team (24%). This suggests that the Brazilian team was in the greatest control of the game. If teams are able to retain possession of the ball, they are able to control and dictate the game. This is similar to previous ball possession studies in football (24) which, among other outcomes, have demonstrated that higher ranked teams have displayed a greater average duration of possession of the ball when compared to lower ranked teams (23). The ball possession outcomes in this study were undoubtedly influenced by individual match conditions, the quality and playing style of the opposition and their ability to retain possession of the ball.

The analysis of match activities was undertaken to determine the differences in specific ball skills between the three teams, and whether skills such as passing and shooting accuracy were different in low performing teams when compared to high performing teams. When considering match activities for each team, the higher performing teams tended to produce higher passing accuracy figures (Brazil: 93%, Spain: 90%), than the Australian team (87%), although this was not significantly different. When data was analysed per minute of match-play, the higher performing teams made a greater number of successful passes than the lower performing team, with the Brazilian team producing a significantly greater value than the other teams (Brazil: 10.7, Spain: 8.68, Australia: 5.31). The Brazilian team produced a higher number of shots on and off goal per minute of match-play (0.73 and 0.81, respectively) which was significantly different to the Spanish team. These results suggest that teams with a greater duration of ball possession will perform more passing and shooting actions than teams

with a lower duration of ball possession. This may lead to greater success (goals scored), however, it may also negatively affect the accuracy rate of passes and shots. This may be directly related to the skill level and playing experience of futsal players (23).

When considering match activities for individual players, although not significantly different, the Australian players recorded 4.06 touches of the ball per minute of match-play, versus 3.32 times for the Spanish players (Table 4). It was expected that the Spanish players would record a greater number of touches on the ball, as has been previously demonstrated in football, where successful teams have produced a greater number of touches on the ball than unsuccessful teams (20, 21), however the current findings did not show this. An observation of the tactical approach and situations in which specific ball skills are performed may provide further insight into these findings, however, such an analysis is beyond the scope of this study.

Low performing futsal players and teams appear to require the development of motor skill and technical skill training in order to improve ball skills and team performance during futsal match-play (28). This is especially important for players and teams transitioning from running clock-time matches to stop-time matches, where the match demands are higher. Match duration may affect pacing strategies, with shorter duration matches, i.e. running clock-time, elevating the high intensity activity output. Such differences in movements may have had implications for the current set of results. As with all match activity variables, the differences may be due to several inherent delimitations of the study

including individual playing and training experience, the nature of each match and the influence of the opposition (9, 28).

A strength of this study lies in the assessment of multiple futsal matches from three continents, with the teams at an equivalent level of competition, thus providing a detailed analysis with a large dataset. Ideally, this study would have used the national teams for comparison, however, the logistical issues associated with analysing sufficient international games did not permit this. Future research should analyse international level matches, such as the Futsal World Championships, which would allow a direct comparison of teams involved in the same competition or tournament, and provide a greater insight into the differences in movement demands and match performance that lead to success. This may also eliminate the limitations involved with cross-league comparisons including timing differences.

Based on the results of this study, it appears that higher performing teams are more astute in their choice of movements and make more effective use of their time on the court when compared to lower performing teams. Higher performing teams also perform less HIA than low performing teams, as they appear to track the game with greater patience. The higher performing teams also demonstrated superior performance in match activities, particularly with passing success, and generally with ball possession. These results suggest that lower HIA output and superior ball possession and passing accuracy appear to be critical determinants in discriminating between successful and unsuccessful match performance. It may be suggested that lower performing teams

may need to reconsider their choice of tactics during match-play in order to be more successful. Further, such players should try to alter their movement activity profiles on the court in order to be able to track the game, the ball and their opponents more closely, without compromising on being caught out of position. Finally, a focus on improving passing accuracy and ball control via motor skill and technical skill training, as well as decision making training, will likely result in more successful futsal players and teams.

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