

Effect of floaters on female players' technical and physical responses in 3v3 small-sided soccer games

KUBAYI, Alliance <<http://orcid.org/0000-0002-8370-3056>> and STONE, Joseph <<http://orcid.org/0000-0002-9861-4443>>

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ABSTRACT

Purpose: The purpose of this study was to analyse and compare the technical and physical responses of professional female soccer players with and without floaters during 3v3 small-sided games (SSGs).

Methods: Twelve female soccer players (age: 24.08 ± 4.25 years; body mass: 62.08 ± 9.29 kg; body height: 1.62 ± 0.05 m) from a South African professional league played in 3v3 small-sided games. Players' physical and technical metrics were captured using commercially available foot-mounted inertial measurement units (PlayerMaker™, Tel Aviv, Israel).

Results: The results showed players covered greater total distances when floaters were present, compared to when they were not ($p < 0.001$, $d = 1.45$, large effect). Furthermore, players in SSGs without floaters recorded significantly greater accelerations ($p < 0.05$, $d = 0.80$, large effect) and decelerations ($p < 0.001$, $d = 1.01$, large effect) than those in SSGs with floaters.

Conclusion: The findings demonstrate that adding floaters during SSGs in female soccer is an effective way to modify greater physical demands, a finding that may be useful to coaches and scientists in developing approaches to meet the goal of training.

Keywords: Task constraints, skill development, distance, acceleration, deceleration

Introduction

Small-sided soccer games (SSGs) are adapted game formats played on smaller fields, utilise fewer participants and have customised rules based on training objectives (1, 2). SSGs have several benefits, including the ability to support adaptive learning and seamless game-related skills development in a realistic game situation (3–5). Furthermore, SSGs offer more frequent ball contacts and duels than traditional 11 vs. 11 games (6–8). SSGs are essential for enabling targeted skill development while also improving decision-making and performance metrics, such as tactical understanding and endurance, which place unique demands on players (7, 8).

The literature indicates a growing interest in SSGs research that examines how players' behaviour is affected by changing task constraints (9, 10). These constraints can be manipulated in a variety of ways, such as by altering the number of ball touches allowed per possession, using goalkeepers, changing the type of marking or pitch size, providing coaching encouragement or feedback and experimenting with different numerical relations (8, 11, 12). A numerical relations constraint that is frequently used by coaches to modify their training sessions is the use of floaters (players that assist both teams in attacking phases of the game) (13, 14). Floaters, who usually join the in-possession team, are crucial for establishing numerical superiority (7). They can be positioned on the field or on the sidelines by adjusting several performance metrics, including tactical, technical, physical and physiological, to account for the position difference (14–16).

From a technical perspective, floaters have been found to reduce the number of dribbles inside the pitch (17). When considering tactical metrics, Padilha et al. (14) found that players used the playing space (width and length) in the opponent's half more effectively during the offensive phase when sideline floaters were present. During the defensive phase, they compacted the defence in their own half (defensive unity) to limit the opponent's space and create numerical inferiority. Praça et al. (18) reported that the 2-floater format inside the field dramatically decreased length, whereas both the 2-floater and 1-floater format inside the field increased width.

From a physical standpoint, Praça et al. (10) discovered that the physiological and physical responses of two-floaters varied according to their position, with midfielders showing the highest physiological and physical reactions because they provide the most support to the offensive phase. Moreover, Pizarro et al. (5) revealed significant variations in their physical metrics, with players covering greater total distances and running with higher intensity when goal line floaters were present. Players also displayed lower heart rate values when there were lateral floaters on the touchline, whereas they demonstrated more acceleration and deceleration

when there were no floaters. Clemente (19) corroborated the finding that different floater placements yield different results and that centre floaters travel the greatest distances as opposed to floaters placed outside the pitch.

Despite a substantial body of literature on the use of floaters in SSGs (4, 5, 7, 10), the extant research has been limited to men's soccer. Consequently, little is known about the use of floaters in women's SSGs or how coaches can best modify numerical constraints to accomplish training objectives. In particular, it is still unclear if female players perform better with or without sideline floaters present. Hence, this study aims to analyse and compare the technical and physical responses of professional female soccer players with and without floaters in 3v3 SSGs.

Methods

Participants

Twelve professional female soccer players (age: 24.08 ± 4.25 years; body mass: 62.08 ± 9.29 kg; stature: 1.62 ± 0.05 m) from a South African team playing in the Hollywoodbet Super League took part in the study. Players were training between 4 and 5 days a week with a match on a weekend.

Design and procedure

To become accustomed to wearing the foot-mounted inertial measurement units (IMUs), players undertook a familiarised sessions one week before data collection began. Each session began with a uniform 20-minute warm-up at low intensity. Over a two-week period, each experimental SSG game was then played on the same natural grass during the in-season phase. On each testing day, the session began at the same time of day (16:30) with the same average atmospheric temperature (19°C). All SSG's were conducted on a 36- by 27-metre field (see figure 1).

Insert Figure 1 here

As shown in Figure 1, two SSG forms were included in the experimental design: (1) 3v3+ 2GKs floater-SSG, where two floaters played for both teams (always assisting the team in the attack); and (2) 3v3 + 2GKs SSG, where no floaters participated. The players were counterbalanced, taking part in SSGs with floaters during the first week and SSGs without floaters during the following week. Each session was 4 minutes for each of the 4 bouts with 2

minutes of passive recovery in between for both SSGs with and without floaters. Floaters could only play with two touches and were limited to staying in wide channels; they could move parallel to sideline, but they were not allowed to score. During the SSGs, the outfield players were instructed not to enter in wide areas to mark the floaters. The same players acted as floaters throughout the SSGs. The participants did receive verbal support from the researcher. To enable quick resumption of the game if the ball went out of bounds, extra balls were positioned closely to the pitch boundary. Players were allowed to drink water during the rest periods in between bouts.

Data collection

Technical and physical metrics were collected using the IMUs (PlayerMaker™, Tel Aviv, Israel). In each IMU, a 2000°•sec⁻¹ triaxial gyroscope and a 16g triaxial accelerometer were integrated from the MPU-9150 multi-chip motion tracking module (InvenSense, California, USA). Each player had two IMUs – one for each foot – which were fastened to the boots with manufacturer-provided silicone straps. The IMUs were positioned at the malleoli on the side. According to Marris et al. (20), IMUs have shown acceptable validity and reliability values. Prior to each training session, each IMU was turned on via Bluetooth to a tablet computer (iPad, Apple Inc., California). After each session, data was uploaded by the first author to the manufacturer's cloud-based software (v.3.22.0.02). Before the data from the manufacturer's cloud-based application were imported into Microsoft Excel 2020, the beginning and ending of each SSG were indicated. The technical metrics included the numbers of touches, releases, successful passes, lost possessions, regains and total time on the ball (21, 22). Physical variables were total distance covered (m), top speed (m/s), high-speed running (HSR) distance (m) (>5.29 m/s), sprinting distance (m) (>6.26 m/s), number of accelerations (>2 m/s/s) and number of decelerations (>-2 m/s/s) (23–25).

Statistical analysis

Statistical analyses were conducted using the Statistical Package for the Social Sciences (SPSS), version 29 (SPSS Inc., Chicago, IL, USA) and Prism version 10 software (GraphPad, San Diego, California, United States). Data is presented as means (M) and standard deviations (SD). Group mean differences are reported with 90% confidence intervals in raw data units. Data normality was checked using the Shapiro-Wilk test before the inferential statistics were performed. The variables (successful passes, lost possessions, regains, HSR and sprinting distance) that were not normally distributed ($p < 0.05$) were evaluated using the Wilcoxon

signed-rank test. While the variables (touches, releases, total time on the ball, distance covered, top speed, accelerations and decelerations) that were normally distributed ($p > 0.05$) were examined for differences between floaters SSGs and non-floaters SSGs. Additionally, Cohen's d effect size (d) was calculated and interpreted as follows: 0.20 (small), 0.50 (moderate) and 0.80 (large) (26).

Results

Figures 2 and 3 present the descriptive statistics and ES of the physical metrics for the SSGs played with and without floaters. The results showed a significant difference for distance covered, with higher scores when floaters were present than when they were not ($M = 502.38$, $SD = 44.12$, $t_{[23]} = 5.14$, $ES = 1.45$, large effect, $p < 0.001$). However, players who played SSGs without floaters recorded significantly greater accelerations ($M = 9.54$, $SD = 4.16$, $t_{[23]} = -2.80$, $ES = 0.80$, large effect, $p < 0.05$) and decelerations ($M = 10.50$, $SD = 3.94$, $t_{[23]} = -4.17$, $ES = 1.01$, large effect, $p < 0.001$) than those who played SSGs with floaters. Furthermore, with a moderate ES of 0.60, participants also observed a somewhat higher top speed in the SSGs played without floaters, although the difference was not significant ($p > 0.05$).

Insert Figure 2 here

Insert Figure 3 here

Figures 4 and 5 show the technical metrics results for the SSGs played with and without floaters. No significant ($p > 0.05$) differences were found for any of the technical variables between the two SSG formats.

Insert Figure 4 here

Insert Figure 5 here

Discussion

This study investigated the influence of technical and physical responses of female professional soccer players during 3v3 SSGs with and without floaters on the sidelines. The main results were increased overall distance travelled in SSGs with floaters and more accelerations and decelerations required in SSGs without floaters. The results show that among professional female soccer players, the presence or absence of floaters during SSGs significantly alters their locomotor running activities, but not their technical demands. The present findings are

consistent with previous research on youth male futsal players (5), which showed significant differences in internal and external physical load measures but no such variations in the technical factors examined.

An important finding was that having floaters during SSGs encouraged greater overall distance covered. Contrary to the current data, earlier research by Sampaio et al. (27) demonstrated that when an extra player was permanently introduced, the teams with numerical advantage had a reduction in the distance travelled. Furthermore, other studies (10, 28) showed that SSGs with numerical advantage in attack, that is, those that include floaters, caused the total distance travelled to decline as compared to SSGs with numerical equality. However, these studies did not take the position of the floater in the field into account. The floater's placement on the goal line may have encouraged the attacking players to pass the ball to the floater in order to gain numerical advantage. As a result, the game would shift to a more direct style of play, resulting in shorter ball possessions and more passes to the floater, which would allow for greater distances covered per minute (5).

The current results also showed that players in SSGs without floaters reported noticeably higher acceleration and deceleration values than players of SSGs with floaters. This indicates that numerical equality in SSGs creates a highly competitive environment that may induce player movement such as a greater number of direction changes. In SSGs with equal numbers, every player usually has a direct opponent, which results in numerous one-on-one duels. Therefore, more feints and dribbles, as well as changes of direction and adjustments in rhythmic displacement, are required to increase attacker-defender spatial-advantage on the field (5, 10, 29). Furthermore, players in SSGs with numerical equality must run to find space or close it down, which causes continuous acceleration and deceleration.

The findings indicated that the SSGs played without floaters had a somewhat greater top speed with a moderate effect size. This may be attributed that when both teams have an equal number of players, there is no simple tactical mismatch to be deployed other than utilising one's physical prowess. This may demonstrate that players must use movement to gain an edge in situations where there are equal numbers, particularly while sprinting to get behind the defence, win loose balls and make quick presses or recovery runs. Consistent with a recent study (7), the results further showed that no significant differences were found on any of the technical metrics between SSGs with and without floaters. Given the lack of noteworthy outcomes and trivial to small effect sizes, it appears that the floater's placement on a sideline has less significance for technical measures than such placement would have if there were no floaters.

Conclusion

The findings indicate that while the presence or absence of floaters during SSGs did not affect technical parameters, it significantly impacted the professional female soccer players' physical indicators. More specifically, the SSGs played with floaters allowed players to cover greater overall distances than the SSGs without floaters, while the latter required players to perform more accelerations and decelerations. The findings show that soccer coaches and scientists may want to include floaters during SSGs in order to modify the physical demands of female soccer players.

Ethics statement

The study received ethical clearance of the university's research ethics committee. The study protocol was explained to the participants, who gave their signed informed consent before participation. The research was carried out in accordance with the local legislation and institutional requirements.

Author contributions

AK: Conceptualization, Writing – review & editing, Writing – original draft, Data curation, formal analysis, Methodology, Project administration. JS: Writing – review & editing, Writing – original draft, Formal analysis, Data curation, Validation, Methodology, Supervision.

Disclosure statement

No author has any financial interest or received any financial benefit from this research.

Conflict of interest

Authors state no conflict of interest.

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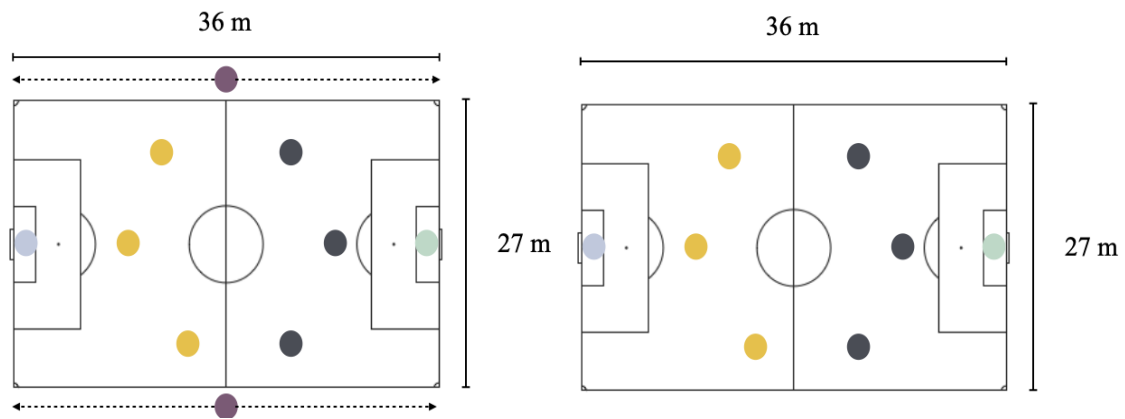


Figure 1. Field dimensions of the SSGs with and without floaters.

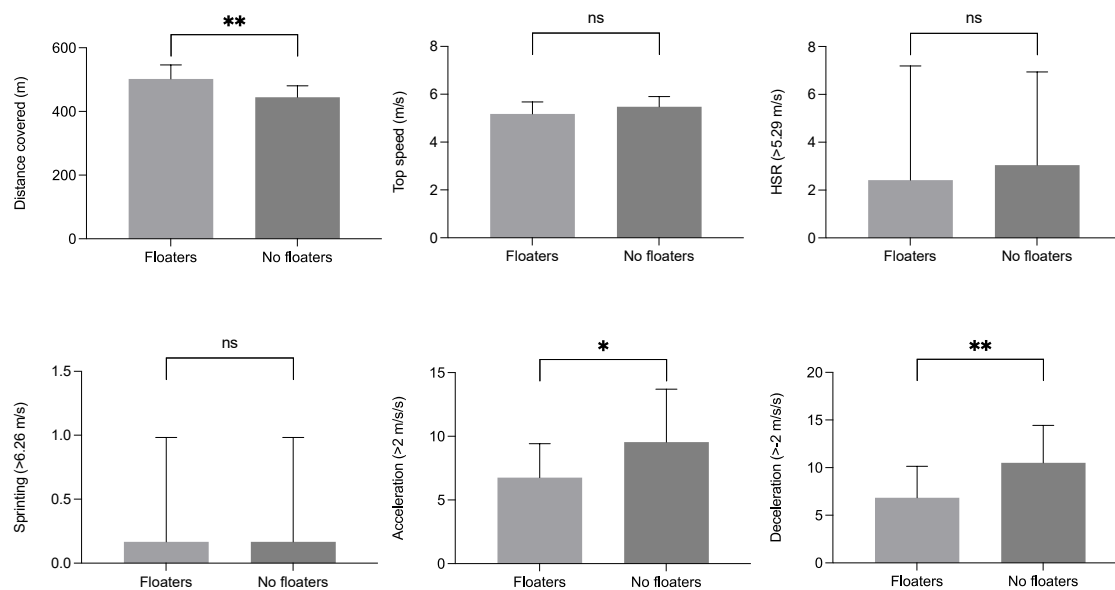


Figure 2. Physical variables for SSGs with and without floaters.

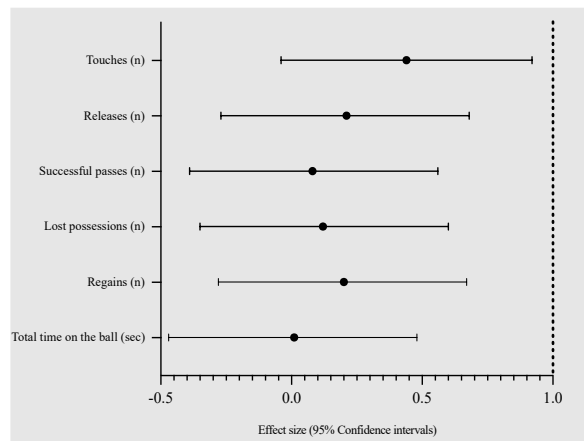
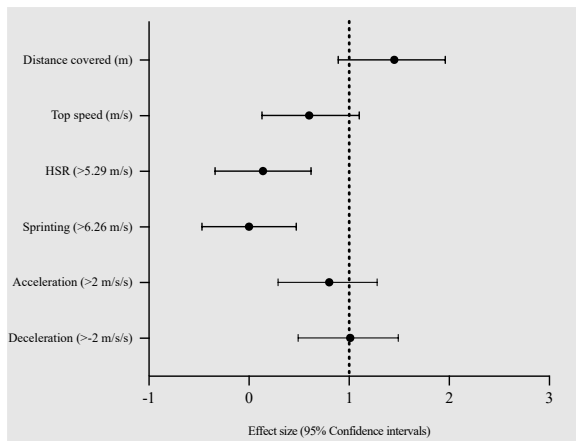


Figure 3. Effect sizes on the physical variables for the SSGs with and without floaters. **Figure 4.** Effect sizes on the physical variables for the SSGs with and without floaters. Error bars indicate uncertainty in the true mean changes with 90 % confidence intervals.

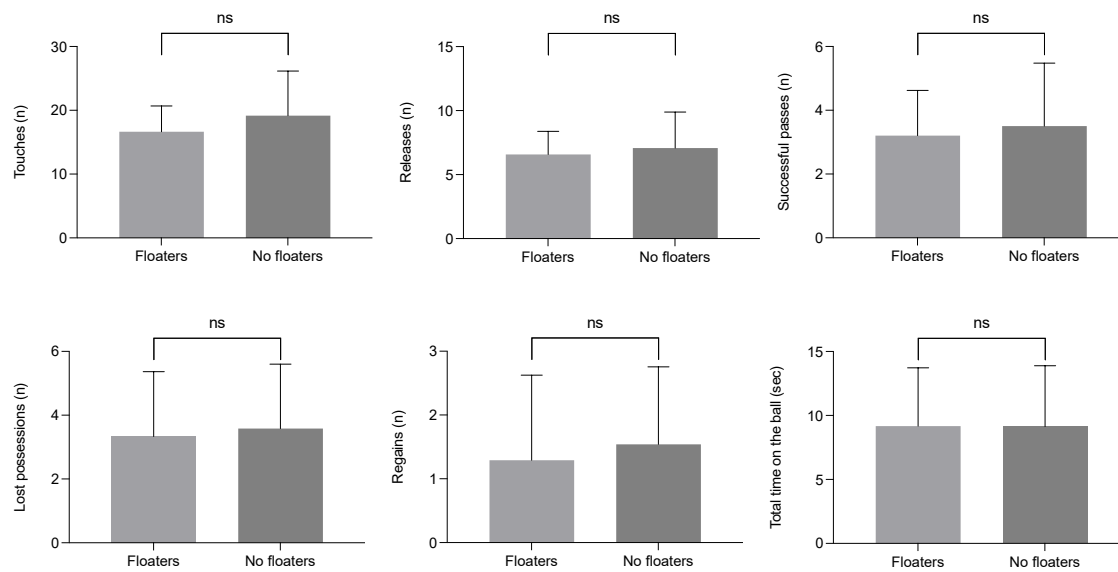


Figure 4. Technical variables for SSGs with and without floaters.