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# Repeated Sprint Ability with Ball Performance among University Soccer Players: The Influence of Direction

**Omar Md Salleh, Nor Fazila Abd Malek, Azali Rahmat, Nur Ikhwan Mohamad, Zulakbal Abd Karim, Ali Md Nadzalan**

***Abstract*: *The aim of this study was to determine and compare the effects of directions on the repeated sprint ability (RSA) with ball performance among university soccer players. Twenty soccer players representing a public university team compete in Malaysian Intervarsity tournament was recruited as study participants. Participants were assigned to two RSA tests with two different directions; i) Right-left-right (RLR) and ii) Left-right-left (LRL). Sprints time, fatigue index and strength of decrement score (Sdec) were compared between the two drills. Repeated measure analysis of variances (ANOVA) was conducted to determine the differences. Results showed no significant differences of were found for each sprints time and total time. However, FI and Sdec were found to be significantly lower during LRL. Future research is suggested to stress on the influences of ball controlling during the slides and turns at the markers on RSA performance.***

***Index Terms*: *RSA, agility, soccer, specificity***

## I. INTRODUCTION

Soccer is one of sport that require players to perform a variety of actions such as strength, power, speed, agility, balance, stability, flexibility and endurance [1-3]. During a soccer match, the players will totally move approximately 10 to 12 km, including sprint runs every 90 seconds (11% of total activity) with each action averaging 2 to 4 seconds and covering 15 meters [4]. Although speed is a very important component of a soccer's success, acceleration may be more important. Acceleration in soccer is mainly performed at short distances that need players to accelerate at maximum intensity although sometimes the longest distance can reach up to about 40 meters and usually involves some change in direction.

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* Correspondence Author
**Omar Md Salleh***, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.
**Nor Fazila Abd Malek**, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.
**Azali Rahmat**, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.
**Nur Ikhwan Mohamad**, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.
**Zulakbal Abd Karim**, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.
**Ali Md Nadzalan**, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.



The term Repeated Sprint Ability (RSA) is given to sports such as soccer because that game requires athletes to consistently produce acceleration at certain distances in certain intervals throughout the duration of the game. Soccer performance is highly dependent on the technical skills and physical fitness level of the players; both of these factors can significantly impact the athlete's performance during game. The simultaneous technical and fitness skills in soccer training will produce great performance [5]. The ability to minimize fatigue and increase repeated sprint ability (RSA) of athletes is believed to be a key to success in soccer [6].

A high-speed action in soccer has been categorized as acceleration that requires maximum speed or agility skills [7]. While Chapman et al. [8] stated that speed in a soccer game contains running speed, reaction speed and acceleration speed during the first step (referring to fastest). Pearson [9] stated that speed and agility are training methods that should be applied to the fitness component of soccer.

Agility is one of the most important components in soccer. In current situation, most physical training exercises are focused on building agility. This training appropriate with the actual situation of the game. However, in the current performance monitoring test session, usually the agility test protocol used only measures agility without the ball. This led to more focus on improving agility without ball in training sessions and subsequently, focusing on improving test performance without the ball. As the most popular sports in the world, many studies have been conducted in soccer including in the field of psychology [10], sociology [11, 12], fitness testing [13, 14] and many more. To be specific in RSA study, previous recent studies had shown that there are differences of RSA performance when performed with and without ball [6, 15] thus urged the important of including ball to the testing and training sessions. As we tend to proceed to the next research progress, we tried to search for RSA testing that applied comparison of different directions.

It was found that lack of study has been conducted on the RSA performance while using ball with different directions moved. Changing direction (right-left-right versus left-right-left) might looked simple among sports practitioners, but until now, we do not know if this called ‘simple’ alterations in RSA direction might cause different in performance especially among a group of soccer players that have similar dominant leg (i.e. in this study: right).

This study was conducted to determine and compare the RSA test performance with ball conducted in different directions (right-left-right versus left-right-left).

The results of this study are expected to benefit coaches and players in terms of their knowledge on the ability to perform repeated sprints with ball in different directions that will later contribute to enhanced understanding of performing physical ability (i.e. speed, acceleration and agility) with ball.

## II. METHODOLOGY

### A. Participants

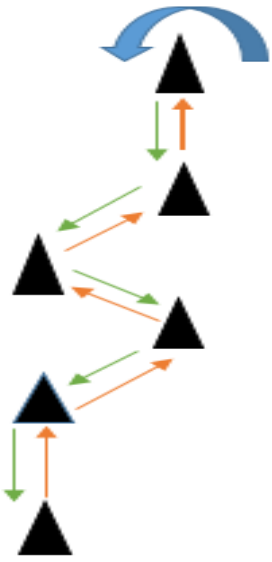
This study involved 20 soccer players that represent Sultan Idris Education University team during Malaysia intervarsity tournament as study participants. All participants were healthy, free of injury and had participated in this study based on volunteerism. Participants were screened prior data collection using Physical Activity Readiness Questionnaire (PAR-Q). Before participating, they need to fill the informed consent. This study had been approved by the Research Management and Innovation Centre, Sultan Idris Education University.

### B. Procedures

Data collection was conducted on a flat soccer ground and cones were placed to form zig-zag pattern (Figure 1 and Figure 2). Before participants were assigned to run, participants were asked to perform warm-up and dynamic stretching for 15 minutes. After warm-up, participants were assigned to perform the RSA drills. RSA drill were conducted in two forms; i) Right-left-right (RLR) and ii) Left-right-left (LRL). The RSA test involved 5 repetitions of maximal effort 40 m run with 60 seconds active rest in between.

During RLR drill, participants were needed to run straight for 4m, then slide to the right 4 m (45˚), slide left 4 m (45˚), slide right 4 m (45˚), and then straight 4 m. Once reach the marker, participants need to turn and performed the previous steps through the markers set (Figure 1).

**Figure 1. RLR RSA**

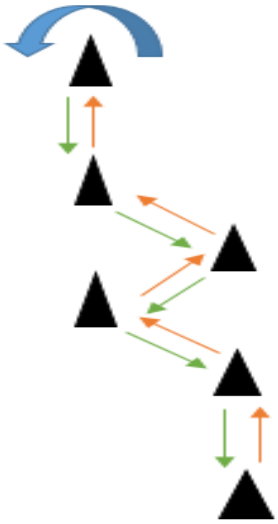


The LRL drill was performed with participants needed to run straight for 4m, then slide to the left 4 m (45˚), slide right 4 m (45˚), slide left 4 m (45˚), and then straight 4 m. Once reach the marker, participants need to turn and performed the previous steps through the markers set (Figure 2).

Participants were given 40 seconds to walk freely during an active rest. After that, participants were asked to return at the starting line twenty seconds before starting each sprint to ready for the start signal instruction. During at starting point all participants were instructed to stand passively and leading their foot with non- dominant leg at the starting line. Instruction for start signal was 'Ready, Set, Go!'.

Timing gate (Microgate, Bolzano, Italy) was located at the starting line to measured 40 m sprint time. While, a hand-held Q&Q Quartz stopwatch (Citizen Watch Co., Ltd., Tokyo, Japan) was located 1 m above the ground to monitor recovery time. For each sprint, participants were asked to stand 0.5 m behind the sensor. Verbal encouragement was provided to all participants during sprints. For the analysis, three types of scores were calculated; i) sprint time, ii) FI, and iii) Sdec.

**Figure 2. LRL RSA**



### C. Formula

The FI was measured to indicate the drop-off in performance from the best to worst sprint performance while Sdec was measured to quantify fatigue by comparing actual performance to an imagined 'ideal performance'(Girard et al. 2011). Both the formula of FI (eq. 1) and Sdec (eq. 2) were adapted from Girard et al. (2011).

**Equation 1**

$$FI = [(Sbest - Sworst) / Sbest] \times 100$$

**Equation 2**

$$Sdec (\%) = [(S1 + S2 + S3 + S4 + S5) / (Sbest \times number\ of\ sprints) - 1] \times 100$$

### D. Statistical analyses

Repeated Measure ANOVA was used to compare the mean score between each sprint and between RLR and LRL. All statistical analyses were conducted using Statistical Package for Social Science (SPSS). Significant value was set at $p < 0.05$.

## III. RESULTS

Table 1 Participants demographic

**Table 1. Participants demographic**

| | Mean ± SD |
|---|---|
| Age (years) | 22.20 ± 2.31 |
| Body mass (kg) | 67.82 ± 5.92 |
| Height (cm) | 173.98 ± 6.92 |

Table 2 showed the mean and SD of RSA performance during RLR drill.

**Table 2. RLR RSA performance**

| Performance | Mean | SD |
|---|---|---|
| Sprint timing 1 | 7.89 | 0.46 |
| Sprint timing 2 | 7.91 | 0.47 |
| Sprint timing 3 | 7.91 | 0.47 |
| Sprint timing 4 | 7.92 | 0.46 |
| Sprint timing 5 | 7.92 | 0.45 |
| Total time | 39.56 | 2.30 |
| FI | 1.02 | 0.38 |
| Sdec | 0.50 | 0.25 |

Within subject analysis showed significant main effects to the sprint times, F(4,96)=4.317; p=0.003. *Pairwise comparison* were conducted for more specific comparison. Results showed that in term of time, sprint 1 was faster compared to other sprint, while other sprints were not different to each other. Table 3 showed the pairwise comparison conducted.

**Table 3. Pairwise comparison between sprints during RLR**

| Comparison between sprints | p-value |
|---|---|
| 1 VS 2 | 0.000* |
| 1 VS 3 | 0.008* |
| 1 VS 4 | 0.001* |
| 1 VS 5 | 0.006* |
| 2 VS 3 | 0.811 |
| 2 VS 4 | 0.519 |
| 2 VS 5 | 0.440 |
| 3 VS 4 | 0.308 |
| 3 VS 5 | 0.404 |
| 4 VS 5 | 0.609 |

***significant**

Table 4 showed the mean and SD of RSA performance during LRL drill.

**Table 4. LRL RSA performance**

| Performance | Mean | SD |
|---|---|---|
| Sprint timing 1 | 7.89 | 0.46 |
| Sprint timing 2 | 7.90 | 0.47 |
| Sprint timing 3 | 7.91 | 0.47 |
| Sprint timing 4 | 7.91 | 0.46 |
| Sprint timing 5 | 7.93 | 0.45 |
| Total time | 39.54 | 2.31 |
| FI | 0.83 | 0.24 |
| Sdec | 0.42 | 0.15 |

Within subject analysis showed significant main effects to the sprint times, F(4,96)=5.85; p=0.00. *Pairwise comparison* were conducted for more specific comparison. Results showed that in term of time, sprint 5 was slower compared to other sprint, while other sprints were not different to each other. Table 5 showed the pairwise comparison conducted.

**Table 5. Pairwise comparison between sprints during LRL**

| Comparison between sprints | p-value |
|---|---|
| 1 VS 2 | 0.255 |
| 1 VS 3 | 0.070 |
| 1 VS 4 | 0.081 |
| 1 VS 5 | 0.001* |
| 2 VS 3 | 0.118 |
| 2 VS 4 | 0.120 |
| 2 VS 5 | 0.002* |
| 3 VS 4 | 1.000 |
| 3 VS 5 | 0.037* |
| 4 VS 5 | 0.055* |

*significant

## IV. DISCUSSIONS

The aim of this study was to determine and compare the RSA performance with different directions (RLR versus LRL) among university soccer players. One thing to be noted in this study was that all the soccer players participated are right-dominant.

For RLR, it was found that the sprint 1 was faster compared to other sprint, while other sprints were not different to each other. This showed that, the soccer players can sprint the fastest only during the first sprint. The positive side in this was that after decrease during the second sprint, no more decrement was found for the other sprints.

For LRL, sprint 5 was slower compared to other sprint, while other sprints were not different to each other. This showed that participants could maintain their sprint from first to the forth sprint, just after the forth they have decrement of performance.

Comparing each sprints time, we can see that no significant differences existed between RLR and LRL. This later bring to no differences of total time taken to finish all the five sprints. However, it was showed that participants obtained lesser FI and Sdec during LRL. This was unexpected, as the participants dominant leg is right, thus showed contrast to our expectation.

What we can relate is that it might be influenced by how they control the ball. Despite RSA were performed in two different directions, participants might not control on the use of legs that they should use. The effectiveness of the legs to make the slide to the right, left and turn might be the contributing factors to the results. And one more, the FI and Sdec that were higher during RLR was also contributed by faster sprint times during the first sprint during RLR.

## V. CONCLUSIONS

In conclusion, this study proved that changing direction during RSA did not affected much on the sprint times. It is suggested for the coaches and players to utilized RSA and agility training using ball to improve their ability to perform both important physical abilities while controlling the ball, which is more specific in soccer real games.

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