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Repeated Sprint Ability with Inclusion of Changing Direction among Veteran Soccer Players

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Abstract. This study was conducted to determine the repeated sprint ability (RSA) with the inclusion of changing direction among veteran soccer players. Twelve main players from a university veteran soccer team were recruited and were required to perform the RSA test in two conditions; i) without ball and ii) with ball. Descriptive statistics and Wilcoxon signed rank test was conducted to determine the mean score and the differences of sprint time, percentage of decrement score of sprinting (Sdec) and fatigue index (FI) between the two conditions. Both conditions demonstrated significantly drop in speed in the fifth sprint. Results showed sprint time, Sdec and FI were found to be significantly different between both conditions. Findings of this study demonstrated the important for specific training to sports for performance enhancement.

1. Introduction

Studies on improving physical abilities among soccer players has been expanding and keep been conducted over the years [1-3]. Several previous studies showed an athlete from a team sport is required to sprint for 1-10% of the total distance covered during the actual game that is almost 1-3% playing time [4-7]. The findings of these studies demonstrated the importance of team sports' athlete to have good ability to sprint repeatedly in order to enhance ball possession for their team.

In accessing the repeated sprint ability (RSA), various protocols of test existed and it is a matter of which test is more specific to be conducted among athletes. Repeated sprint ability (RSA) is defined as the capability to reproduce maximum speed over a series of sprints [8]. Study by Rampinini, Bishop [9] has shown the average time recorded during an RSA test predicted the distance of high-intensity running (>19.8km/h), and the total sprint distance during a professional soccer match. Thus, it can be seen that RSA development can positively affect performance of a team.

Several methods have been examined and have found to improve RSA [10-15]. However, before starting a test, it is important to assess the performance of the athletes so that the initial level of the players can be obtained besides can know the suitability of the tests conducted.

In conducting RSA test or training, one of the things to be considered is the fatigue developed during the exercise as this will reveal the athlete's ability to withstand fatigue. Fatigue in RSA refer to the decrement of the maximal power output or speed (i.e. during cycling or running), although the individuals can sustained the task [14]. Fatigue during RSA training has been shown can rapidly develop as early as just after the first sprint Mendez-Villanueva, Hamer [16].

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It is important to reduce the fatigue development during games as the ability to produce maximum sprints may increase the chance to win ball possession that may positively affect the final outcome of a game. However, the inability to produce maximum speed during sprinting will increase the risk of losing ball possession and even concede goals. For example, study by Paton, Hopkins [17] have demonstrated that a ~0.8% reduction in sprint speed would increase the likelihood of a player losing possession of the ball against an opponent, when both players sprint for the ball.

Despite increasing number of scientific studies on RSA [5, 9, 18-21] lack of data existed on the RSA among veteran athletes. It is unknown on how the performance of veteran athletes in RSA causing the training program for them always been in general form. It was the aim of this study to determine the repeated sprint ability (RSA) with the inclusion of changing direction among veteran soccer players. The RSA was analysed through the sprint time, percentage decrement score of sprinting (Sdec) and fatigue index (FI).

2. Methodology

2.1. Participants

Twelve university veteran football representatives (mean age = 44.69 ± 2.03 years old) were recruited for this study. Participants were currently active training three times per week and were in their preparation phase for inter-varsity competition. PAR Q was used to screened participants prior to testing. Each participant has read and signed an informed consent for research participation approved by the Research Management and Innovation Centre, Universiti Pendidikan Sultan Idris (Code: RAGS/2013/UPSI/SG/01/2). All participants were informed on the study aims and procedures before the data collection.

2.2. RSA Procedures

Figure 1. RSA test set-up developed for this study [image taken from Salleh, Nadzalan [22]]

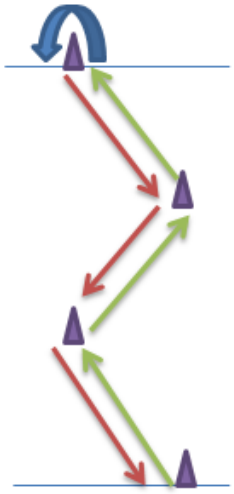

Figure 1 showed the RSA test set-up developed for this study. The RSA test involved 5 repetitions of maximal effort 40 m run with 60 seconds active rest in between. Participants were needed to run 6 m (60˚ straight to the left) before make the first turn (60˚ straight to the right for 7 m) and then make the second turn (60˚ straight to the left for 7 m) and continue to the end line before return back. During the return back, participants made 180˚ turn and also need to run through the two turns to go back to the starting point. Markers were placed at all the points that participants need to make turns.

One minute recovery consisted of 40 seconds walk around and twenty seconds before the start of next sprint, participants need to get ready at the starting line and await the start signal from an instructor. Participants were instructed to stand passively with non-dominant leg were used as a leading foot at the starting line. 'Ready, Set, Go!' was used as the start signal involve the instruction of the instructor.

Two RSA test were needed to be performed by all participants; one without ball and one with ball. For with ball RSA test, participant need to sprint while dribbling the ball until reached the 20 m point where they were needed to kick the ball to a small goal that had been set up 7 m straight away from the 20 m point. Participants just need to sprint back to the starting line without ball.

A timing gate (Microgate, Bolzano, Italy) was used to measure the sprint time the timing gate was placed at the starting line, 1 m above the ground. The investigators used a hand-held Q&Q Quartz stopwatch (Citizen Watch Co., Ltd., Tokyo, Japan) to monitor recovery time. The participants commenced each sprint, starting from a standing position 0.5 m behind the sensor. Strong verbal encouragement was provided to each participant during all sprints. Three scores were calculated for the analysis; i) sprint time, ii) FI, and iii) Sdec.

2.3. Formula

Both the formula of FI (eq. 1) and Sdec (eq. 2) were adapted from Girard, Mendez-Villanueva [14]. Sdec was measured to quantify fatigue by comparing actual performance to an imagined 'ideal performance' while FI was measured to indicate the drop-off in performance from the best to worst sprint performance [14].

Equation1

$$FI = [(S_{best} - S_{worst}) / S_{best}] \times 100$$

Equation 2

$$Sdec\ (\%) = [(S_1 + S_2 + S_3 + S_4 + S_5) / (S_{best} \times \text{number of sprints}) - 1] \times 100$$

2.4. Statistical Analysis

Normality of data was examined using Shapiro-Wilk test. The mean and standard deviation of participants' physical characteristics, sprint time, Sdec and FI were analysed using descriptive statistics while Wilcoxon signed rank test was conducted to assess the different of sprint time, FI and Sdec of the RSA test performed with ball and without ball.

3. Results

Table 1 showed the physical characteristics of participants.

Table 1. Physical characteristics of participants

	Mean ± SD
Age (years)	44.69 ± 2.03
Body mass (kg)	70.18 ± 5.69
Height (cm)	170.25 ± 4.38

Table 2 showed the time for each sprint in RSA without ball conditions. Sprint 1 and Sprint 2 were shown to be significantly faster compared to Sprint 5 (Sprint 1, $p = 0.01$; Sprint 2, $p = 0.021$).

Table 2. Sprint time without ball

Sprint	RSA time without ball (s) Mean ± SD
Sprint 1	8.77 ± 0.83
Sprint 2	8.84 ± 0.99
Sprint 3	8.88 ± 0.98
Sprint 4	8.89 ± 0.84
Sprint 5	9.15 ± 1.10

Table 3 showed the time for each sprint in RSA with ball conditions. Sprint 1 and Sprint 2 were shown to be significantly faster compared to Sprint 5 (Sprint 1, $p = 0.04$; Sprint 2, $p = 0.04$).

Table 3. Sprint time with ball

Sprint	RSA time with ball (s) Mean ± SD
Sprint 1	9.96 ± 0.96
Sprint 2	9.99 ± 1.09
Sprint 3	10.07 ± 1.01
Sprint 4	10.14 ± 0.99
Sprint 5	10.14 ± 1.21

Table 4 showed the comparison of average sprint time, FI and Sdec between RSA without ball and with ball. Results showed the sprint time without ball was significantly faster compared to sprint time with ball, $p < 0.01$. Besides that, FI and Sdec were found to be significantly higher in with ball condition, $p < 0.01$.

Table 4. Comparison of average sprint time, FI and Sdec between RSA without ball and with ball

	Time (s) Mean ± SD	FI Mean ± SD	Sdec Mean ± SD
RSA without ball	8.90 ± 0.92	7.15 ± 4.06	2.87 ± 1.19
RSA with ball	10.06 ± 1.03	5.15 ± 2.90	2.43 ± 1.46
% difference	13%	27.97%	15.33%
sig	0.002	0.002	0.002

i) Time = average sprint time, ii) FI = fatigue index, iii) Sdec = percentage decrement score of sprinting, iv) % difference = percentage difference of score between without ball and with ball, v) sig = p-value.

4. Discussions

Repeated sprint ability with the inclusion of changing direction among veteran soccer players were examined as the purpose of this study. Participants performed the RSA test in two conditions; one without ball and one with ball.

In without ball condition, Sprint 1 and Sprint 2 were shown to be significantly faster compared to Sprint 5 (Sprint 1, $p = 0.01$; Sprint 2, $p = 0.021$). This showed that participant didn't able to maintain their speed in the fifth sprint thus causing it to be significantly slower compared to the earlier sprints. Table 3 showed the time for each sprint in RSA with ball conditions. Again, Sprint 1 and Sprint 2 were shown to be significantly faster compared to Sprint 5 (Sprint 1, $p = 0.04$; Sprint 2, $p = 0.04$). As

in the without ball condition, this also showed that participants sprint performance drop significantly in the last sprint.

Table 4 showed the comparison of average sprint time, FI and Sdec between RSA without ball and with ball. Researchers have tended to use two terms as a way to quantify the ability to resist fatigue during RSE, which are; i) fatigue index (FI) and/or ii) the percentage decrement score (Sdec) [14]. The FI has generally been calculated as the drop-off in performance from the best to worst sprint performance during an RSE whereas the Sdec attempts to quantify fatigue by comparing actual performance to an imagined 'ideal performance' (i.e. where the best effort would be replicated in each sprint) [14].

Results in this study showed the sprint time without ball was significantly faster compared to sprint time with ball, $p < 0.001$. Besides that, FI and Sdec were found to be significantly higher in with ball condition, $p < 0.01$. As in Salleh, Nadzalan [22], this finding also found that without ball condition produce greater sprint ability. This demonstrated no matter whom the population is, the sprint performance drop when in with ball condition. Findings also found FI to be higher, demonstrated that participants easier to become fatigue when in with ball condition.

Overall, this study demonstrated the lack of sprint ability and less fatigue-resistance when running with ball. This condition is a thing that should be taken care, as it is the ball control that is important in a soccer match. The inability to move better when in ball position inflicts the cases of ball possession that might occur in real game.

It is stressed that every team and players to enhanced their capability to sprint with ball efficiently. Training should be performed to enhance this aspect. Many types of training can be performed to improve RSA and among of them are the intermittent-sprint, repeated-sprint, speed, agility and quickness (SAQ) and coordination training [10-14].

5. Conclusions

To conclude, it can be seen from this study that the ability to sprint repeatedly were depending on the level of condition. It is important to be noticed that the RSA procedure used in this study has taken into account the specific requirement of soccer players in the real game. Future studies were suggested to be conducted on the high level soccer players (i.e. national level) and the methods to reduce FI and Sdec such as training method and dietary intake.

References

[1] Eniseler, N., et al., *High-intensity small-sided games versus repeated sprint training in junior soccer players.* Journal of Human Kinetics, 2017. 60(1): p. 101-111.

[2] Franco-Marquez, F., et al., *Effects of combined resistance training and plyometrics on physical performance in young soccer players.* International Journal of Sports Medicine, 2015. 94(11): p. 906-914.

[3] Md Noor, A., et al., *The effectiveness of "Small, Medium and Big Games" training on cardiovascular endurance among university football llayers.* International Journal of Academic Research in Progressive Education and Development, 2017. 6(4): p. 157-162.

[4] Buchheit, M., et al., *Repeated-sprint sequences during youth soccer matches.* International Journal of Sports Medicine, 2010. 31(10): p. 709-716.

[5] Spencer, M., et al., *Physiological and metabolic responses of repeated-sprint activities.* Sports Medicine, 2005. 35(12): p. 1025-1044.

[6] Spencer, M., D. Bishop, and S. Lawrence, *Longitudinal assessment of the effects of field-hockey training on repeated sprint ability.* Journal of Science and Medicine in Sport, 2004. 7(3): p. 323-334.

[7] Stølen, T., et al., *Physiology of soccer.* Sports Medicine, 2005. 35(6): p. 501-536.

[8] Bishop, D., O. Girard, and A. Mendez-Villanueva, *Repeated-sprint ability—Part II.* Sports Medicine, 2011. 41(9): p. 741-756.
[9] Rampinini, E., et al., *Validity of simple field tests as indicators of match-related physical performance in top-level professional soccer players.* International Journal of Sports Medicine, 2007. 28(03): p. 228-235.
[10] Milanović, Z., et al., *Effects of a 12 week saq training programme on agility with and without the ball among young soccer players.* Journal of Sports Science & Medicine, 2013. 12(1): p. 97.
[11] Venturelli, M., D. Bishop, and L. Pettene, *Sprint training in preadolescent soccer players.* International Journal of Sports physiology and Performance, 2008. 3(4): p. 558-562.
[12] Balsom, P., et al., *Maximal-intensity intermittent exercise: effect of recovery duration.* International Journal of Sports Medicine, 1992. 13(07): p. 528-533.
[13] Duffield, R., M. King, and M. Skein, *Recovery of voluntary and evoked muscle performance following intermittent-sprint exercise in the heat.* International Journal of Sports Physiology and Performance, 2009. 4(2): p. 254.
[14] Girard, O., A. Mendez-Villanueva, and D. Bishop, *Repeated-sprint ability—Part I.* Sports Medicine, 2011. 41(8): p. 673-694.
[15] Bishop, D. and B. Claudius, *Effects of induced metabolic alkalosis on prolonged intermittent-sprint performance.* Medicine and Science in Sports and Exercise, 2005. 37(5): p. 759-767.
[16] Mendez-Villanueva, A., P. Hamer, and D. Bishop, *Fatigue in repeated-sprint exercise is related to muscle power factors and reduced neuromuscular activity.* European Journal of Applied Physiology, 2008. 103(4): p. 411-419.
[17] Paton, C.D., W.G. Hopkins, and L. Vollebregt, *Little effect of caffeine ingestion on repeated sprints in team-sport athletes.* Medicine and Science in Sports and Exercise, 2001. 33(5): p. 822-825.
[18] Bravo, D.F., et al., *Sprint vs. interval training in football.* International Journal of Sports Medicine, 2008. 29(8): p. 668-674.
[19] Impellizzeri, F., et al., *Validity of a repeated-sprint test for football.* International Journal of Sports Medicine, 2008. 29(11): p. 899.
[20] Perrey, S., et al., *Neural and muscular adjustments following repeated running sprints.* European Journal of Applied Physiology, 2010. 109(6): p. 1027-1036.
[21] Spencer, M., et al., *Time–motion analysis of elite field hockey, with special reference to repeated-sprint activity.* Journal of Sports Sciences, 2004. 22(9): p. 843-850.
[22] Salleh, O.M., et al., *Repeated sprint ability depending on the level of condition among university soccer players.* International Journal of Academic Research in Business and Social Sciences, 2017. 7(6): p. 506-514.