



COMPARISON OF REPEATED SPRINT ABILITY AND FATIGUE INDEX AMONG MALE HANDBALL PLAYERS WITH RESPECT TO DIFFERENT PLAYING POSITION

B. Chittibabu^{a,*}

^aDepartment of Physical Education and Sports Sciences, Annamalai University,
Chidambaram- 608002, Tamilnadu, India

*Corresponding Author Ph: +(91) - 9443531508; Email: chittibabu.au@gmail.com

DOI: 10.26524/14112

ABSTRACT

The intent of the present study was to compare repeated sprint ability and fatigue index among male handball players with respect to different playing position. I have selected thirty two (32) male handball players from Department of Physical Education and Sports Sciences, Annamalai university, Chidambaram, Tamilnadu, India. These players were classified into four groups as backs (n = 12), wings (n = 7), pivots (n = 7) and goalkeepers (n = 6) respectively. These selected subjects, who practice handball regularly and take part in competition. The selected subjects mean age: 21.62 ± 1.90 years; weight: 64.59 ± 7.25 kg and height: 172.07 ± 7.25 cm. The volunteered subjects signed a separate consent form to participate in the study. The repeated sprint ability and fatigue index were selected as criterion variables. To evaluate the repeated sprint ability and fatigue index all subjects completed multiple sprint running protocols, which consisted of 7×30 m sprints repeated at 25 s intervals. The total sprint time was calculated by summation of all seven sprint time and fatigue index was calculated from sprint times using the following formulae: $\text{Fatigue} = \{(\text{slowest sprint} - \text{fastest sprint}) / \text{fastest sprint}\} \times 100$. The collected data was analysed using one way Analysis of variance (ANOVA). When *F* ratio was found significant, Scheffe's post hoc test was applied to know the difference between the four groups. The result of the study showed that total sprint time ($F = 6.163$, $p = 0.002$) and fatigue index ($F = 4.577$, $p = 0.010$) showed a significant difference among male handball players in different playing position. It denotes that total sprint time and fatigue index found to be best in wing players and poor in goalkeepers. It is concluded that lower total sprint time and fatigue index by repeated sprint ability is an important for wing players as they are the players who perform the most picks and require high levels of aerobic capacity to aid recovery after high-intensity bouts of activity. However, it also required for back court, pivot and goal keepers. Its importance cannot be neglected since all the field players in the court gets equal chance for fast break and quick counterattacks. The role of the repeated sprint ability is greater and which determines the result of the match.

Keywords: Repeated sprint ability, Total sprint time, Fatigue index, Handball, Players, Male

Introduction

Handball around the world is more

dynamic and faster than ever before. The modification of rules and implementing



various training methodologies resulted in drastic change in the playing format of the game. Handball is a strenuous contact Olympic team sport that places emphasis on running, jumping, sprinting, arm throwing, hitting, blocking, and pushing. Among repeated sprint ability has an significant role during a handball match, where players sprint repeatedly for attack and defence. Repeat sprint ability (RSA) describes the ability of an athlete to recover and maintain maximal effort during subsequent sprints, an attribute considered important to team sports. It is often trained and measured via high-intensity sprints, interspersed with brief recovery bouts (≤ 30 seconds).

Handball game constitutes of two half's with duration of 30 minutes each half. The players have to sprint intermittently without getting fatigue. To sprint repeatedly, the aerobic system must resynthesize polymerase chain reaction, remove accumulated intracellular inorganic phosphate, and oxidize lactate during rest periods. Whether this can be appreciably improved via a high VO_2max remains controversial. However, it is likely improved

via anaerobic qualities such as strength, power, and speed, along with the athlete's velocity at onset of blood lactate accumulation. When reporting repeat sprint ability test results, total or mean time should be used analysing the players efficiency.

The fatigue index is a term most often used to indicate the rate at which an athlete's power output declines. It can be used as an indicator of an athlete's aerobic endurance. According to [1] fatigue index shows temporal oscillation with greater decline in power output during morning than evening. Fatigue index in across different age groups varies. [2,3] reported that young subjects fatigue less during repeated sprint protocol compared to adults. Given that, among young subjects, recovery mode might exert less effect on repeated sprint ability. The intent of the present study was to compare repeated sprint ability and fatigue index among male handball players with respect to different playing position.

Methodology

Subjects

Thirty two (32) male handball players were selected from Department of Physical Education and Sports Sciences, Annamalai university, Chidambaram, Tamilnadu, India. These players were classified into four groups as backs ($n = 12$), wings ($n = 7$), pivots ($n = 7$) and goalkeepers ($n = 6$) respectively. These selected subjects, who practice handball regularly and take part in competition. The selected subjects mean age: 21.62 ± 1.90 years; weight: 64.59 ± 7.25 kg and height: 172.07 ± 7.25 cm. The volunteered subjects signed a separate consent form to participate in the study.

Variables and Test

The repeated sprint ability and fatigue index were selected as criterion variables. To evaluate the repeated sprint ability and fatigue index all subjects completed multiple sprint running protocols, which consisted of 7×30 m sprints repeated at 25 s intervals [4]. The subjects were given verbal signal provided a 10 second countdown to start of each sprint and subjects were verbally encouraged to give maximal effort. All timing was recorded manually using a stop watch by establishing both tester and equipment reliability.

Testing

All testing was conducted

outdoor handball court with mud surface. Prior to the test, subjects performed a standardised warm-up followed by test. After completion of the test they were instructed to perform suitable warm-down for 20 minutes. The total sprint time was calculated by summation of all seven sprint time and fatigue index was calculated from sprint times using the following formulae: $\text{Fatigue} = \{(\text{slowest sprint} - \text{fastest sprint}) / \text{fastest sprint}\} \times 100$.

Statistical technique

The collected data was analysed using one way Analysis of variance (ANOVA). When F ratio was found significant, Scheffe's post hoc test was applied to

know the difference between the four groups. All the statistical tests were calculated using the statistical package for the social science (SPSS) for windows (Version 16).

Results

Table 1 clearly shows that total sprint time ($F = 6.163$, $p = 0.002$) and fatigue index ($F = 4.577$, $p = 0.010$) showed a significant difference among male handball players in different playing position. It denotes that total sprint time and fatigue index found to be best in wing players and poor in goalkeepers (Figure 1 & 2).

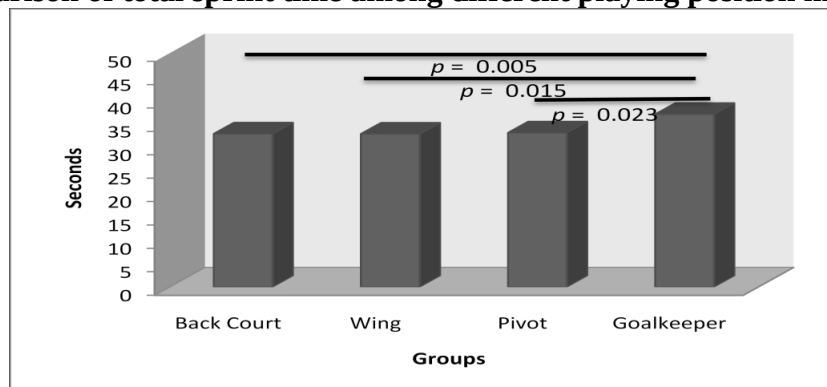
Table 1
ANOVA for Total Sprint time and fatigue index

Variables	Source of Variance	Sum of Squares	df	Mean Square	F	Sig.
Total sprint time (Seconds)	Between Groups	83.458	3	27.819	6.163	.002
	Within Groups	126.397	28	4.514		
Fatigue Index (%)	Between Groups	128.116	3	42.705	4.577	.010
	Within Groups	261.273	28	9.331		

Since F is significant Scheffe's post hoc test was performed. It showed a significant difference on total sprint time between back court vs. goalkeeper

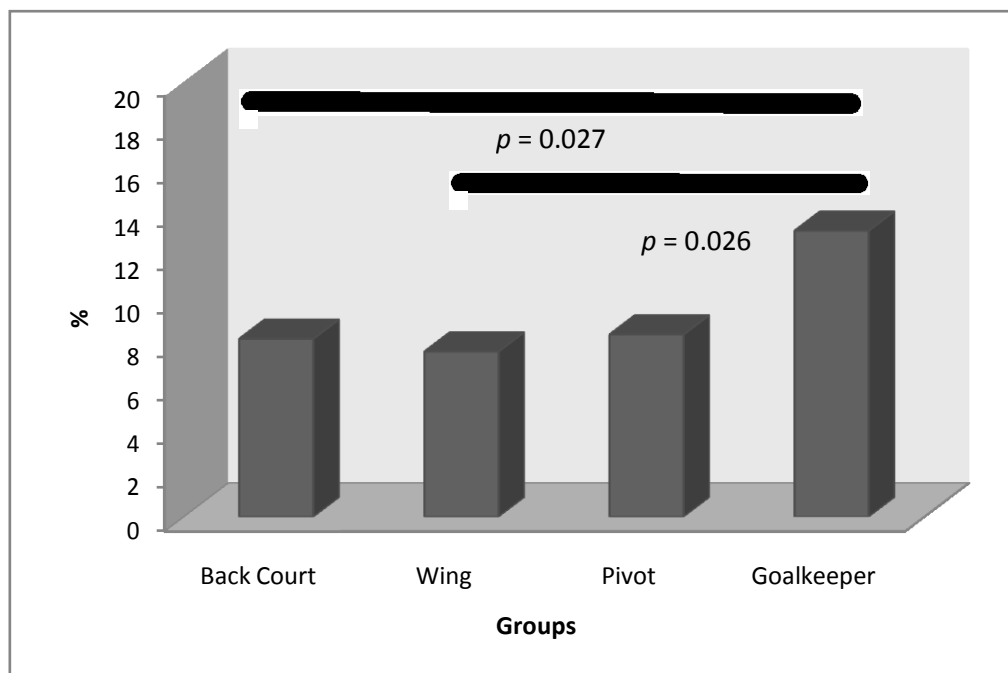
($p = 0.005$), wing vs. goalkeeper ($p = 0.015$) and pivot vs. goalkeeper ($p = 0.023$). these differences are presented in figure 1.

Figure 1
Comparison of total sprint time among different playing position male handball players



Similarly, fatigue showed a significant difference between back court vs. goalkeeper ($p = 0.027$) and wing vs. goalkeeper ($p = 0.026$). These differences are presented in figure 2.

Figure 2
Comparison of fatigue index among different playing position male handball players



Discussion

In the present study wing players showed lower total sprint time (32.75 sec) and lower fatigue index (7.60 %) than others. Previous studies has reported that wings players cover significantly greater total distance during the game than other players, whereas goalkeepers cover the least total distance [5,6]. These differences were expected because of the wings specific task during a match. Wing players cover the largest distance during a match, compared to the pivots and backcourt players. In the phase of transition between defense and attack, they are the only players who run from one goal line to other goal line (approx. 35 m *per* transition), while the pivot players have to run from one 6 m goal area to the other 6 m goal area. Meaning they have to run 12

meters less during each turnover and goal keeper moves hardly 20 meters. The ability to sprint repeatedly in quick succession is determined by the aerobic system's ability to resynthesize PCr, remove accumulated intracellular Pi, and oxidize lactate during rest periods.

Although several researchers have suggested that higher VO_{2max} may foster recovery and promote multi sprint performance [7-9]. Bishop and his colleagues (2003) [10] showed the existence of a stronger correlation between aerobic capacity and repeated sprint ability. Chittibabu (2013) [11] who compared the aerobic capacity among different playing position handball players and identified that wing players showed greater aerobic capacity. These factors influences might have paved the route for difference and wing players



demonstrating lower total sprint time and fatigue index.

Conclusion

It is concluded that lower total sprint time and fatigue index by repeated sprint ability is an important for wing players as they are the players who perform the most picks and require high levels of aerobic

capacity to aid recovery after high-intensity bouts of activity. However, it also required for back court, pivot and goal keepers. Its importance cannot be neglected since all the field players in the court get equal chance for fast break and quick counterattacks. The role of the repeated sprint ability is greater and which determines the result of the match.

References

1. B. Chittibabu, Evaluation of fatigue index at different times of the day on male handball player, *International Journal of Current Advanced Research*, 2 (2013) 53-54.
2. S. Ratel, C. A. Williams, J. Oliver, N. Armstrong, Effects of age and recovery duration on performance during multiple treadmill sprints, *International Journal of Sports Medicine*, 27 (2006) 1-8.
3. S. Ratel, C. A. Williams, J. Oliver, N. Armstrong, Effects of age and mode of exercise on power output profiles during repeated sprints, *European Journal of Applied Physiology*, 92 (2004) 204-210.
4. N. Rebelo, P. Krstrup, J. Soares, J. Bangsbo, Reduction in intense intermittent exercise performance during a soccer match, *Journal of Sports Sciences*, 16 (1998) 482-483.
5. P. Luig, C. Manchado-Lopez, M. Perse, M. Kristan, I. Schander, M. Zimmermann, T. Henke, P. Platen (2008) Motion characteristics according to playing position in international men's team handball, *13th Annual Congress of the European College of Sports Science*, Portuga: Estoril.
6. M. Šibila, D. Vuleta, P. Pori, Position related differences in volume and intensity of large scale cyclic movements of male players in handball, *Kinesiology*, 36 (2004) 58-68.
7. A. L. Hamilton, M. E. Nevill, S. Brooks, C. Williams, Physiological responses to maximal intermittent exercise: differences between endurance-trained runners and games players, *Journal of Sports Sciences*, 9 (1991) 371-382.
8. M. Spencer, D. Bishop, B. Dawson, C. Goodman, Physiological and metabolic responses of repeated-sprint activities specific to field-based team sports, *International Journal of Sports Medicine*, 35 (2005) 1025-1044.
9. D. L. Tomlin, H. A. Wenger, The relationship between aerobic fitness and recovery from high intensity intermittent exercise, *International Journal of Sports Medicine*, 31 (2001) 1-11.
10. D. Bishop, S. Lawrence, M. Spencer, Predictors of repeated sprint ability in elite female hockey players, *International Journal of Sports Medicine*, 6 (2003) 199-209.
11. B. Chittibabu, A comparison of aerobic capacity among male handball players in different playing positions, *International Scientific Journal of Sport Sciences*, 2 (2013) 9-13.