European Journal of Molecular & Clinical Medicine
ISSN 2515-8260 Volume 07, Issue 02, 2020

CHANGES OF DIRECTION SPEED AND REACTIVE AGILITY PERFORMANCE USING BADMINTON REACTIVE AGILITY TESTS SYSTEM (BRATS) AMONG STATE, DISTRICT AND SCHOOL BADMINTON PLAYERS

Frederick, M.F.A[1,2], Izwyn Zulkapri[2], Kamaruzaman Soeed[2], Iqbal Tariq[2], Tiawa Awang Hj Hamid[2], Abdul Hafidz Omar[2], Khairuddin Hasan[2] & Ali Md Nadzalan[1]

[1]Faculty of Sports Science & Coaching, Universiti Pendidikan Sultan Idris, Malaysia
[2]Sport Innovation and Technology Centre (SITC), Universiti Teknologi Malaysia

fadhil@fsskj.upsi.edu.my

Abstract *-- The aim of this study was to compare the changes of direction speed (CODS) and reactive agility (RA) performance using badminton reactive agility tests system (BRATS) among different level of badminton players. Fifty-five under-15 male badminton players consisted of state (N = 10), district (N=15) and school (N=30) were recruited and were asked to perform both CODS and RA tests using BRATS. Findings of this research revealed that the CODS and RA were found to be significantly different between state, district and school players. In conclusion, BRATS is an instrument that are capable of assessing and differentiate level of badminton players based on CODS and RA aspects.*

Keywords: *Changes of Direction Speed (CODS), Reactive Agility (RA), performances*

1. INTRODUCTION

Badminton is a highly exclusive sport that involves a unique movement technique on a relatively small court area (1). It is a brief sport that requires a long period of high intensity exercise interspersed with rest periods and entails quick and strong movement of both lower and upper body parts (2). It requires the players to do quick sprints, stops, starts, lunges, jumps, rapid changes of direction, twists, stretches, smashes, clearing, dropping, and trying to win the opponent (3, 4). The players must always be alert and have quick response to movements of the opponent, the shuttle, the footwork, and the strokes of other players (5).

As the nature of badminton consisted repetitive, short-duration, high-intensity efforts with high-frequency movement (6), players need to have good change of direction ability in the court. Using 505 Agility Test, Güçlüöver and Demirkan (7) found the elite badminton players were significantly agiler compared to the amateur players. This showed the importance of agility and change of direction ability in badminton game in such it can differentiate the level of plays

According to Lees (8), racket sports have their own physical requirements comprising a number of fitness components. To be able to execute advanced strokes or compete effectively against opponents, especially the stronger ones, a player would need to develop a higher level of basic physical qualities such as strength, power, muscular endurance, flexibility, coordination, and agility. Body composition is also important to badminton sport, as excess fat tends to disadvantage the players in moving quickly across the court and hitting the shuttle (9, 10).

The traditional definition of agility emphasizes on the speed in the directional change as the defining component (11). Young et al. (12) claimed that agility consists of two key sub-components: speed in changing direction and cognitive factors. More recently, agility is identified as "a rapid whole body movement with change of velocity or direction in response to a stimulus" (13, 14). The newer definition of agility includes cognitive skills in determining agility performance and the definition applies to open skills only. Open skills cannot be pre-planned, whereas closed skills such as sprint running or pre-determined changes of direction can be pre-planned (15).

The training of the agility component in badminton does not focus on the movement pattern used in the actual game but is usually trained using general agility movements, thus not allowing the players, especially juniors, to fully grasp the proper movement and become proficient in moving around the court. The aim of this study was to compare the changes of direction speed (CODS) and reactive agility (RA) performance using badminton reactive agility tests system (BRATS) among different level of badminton players.

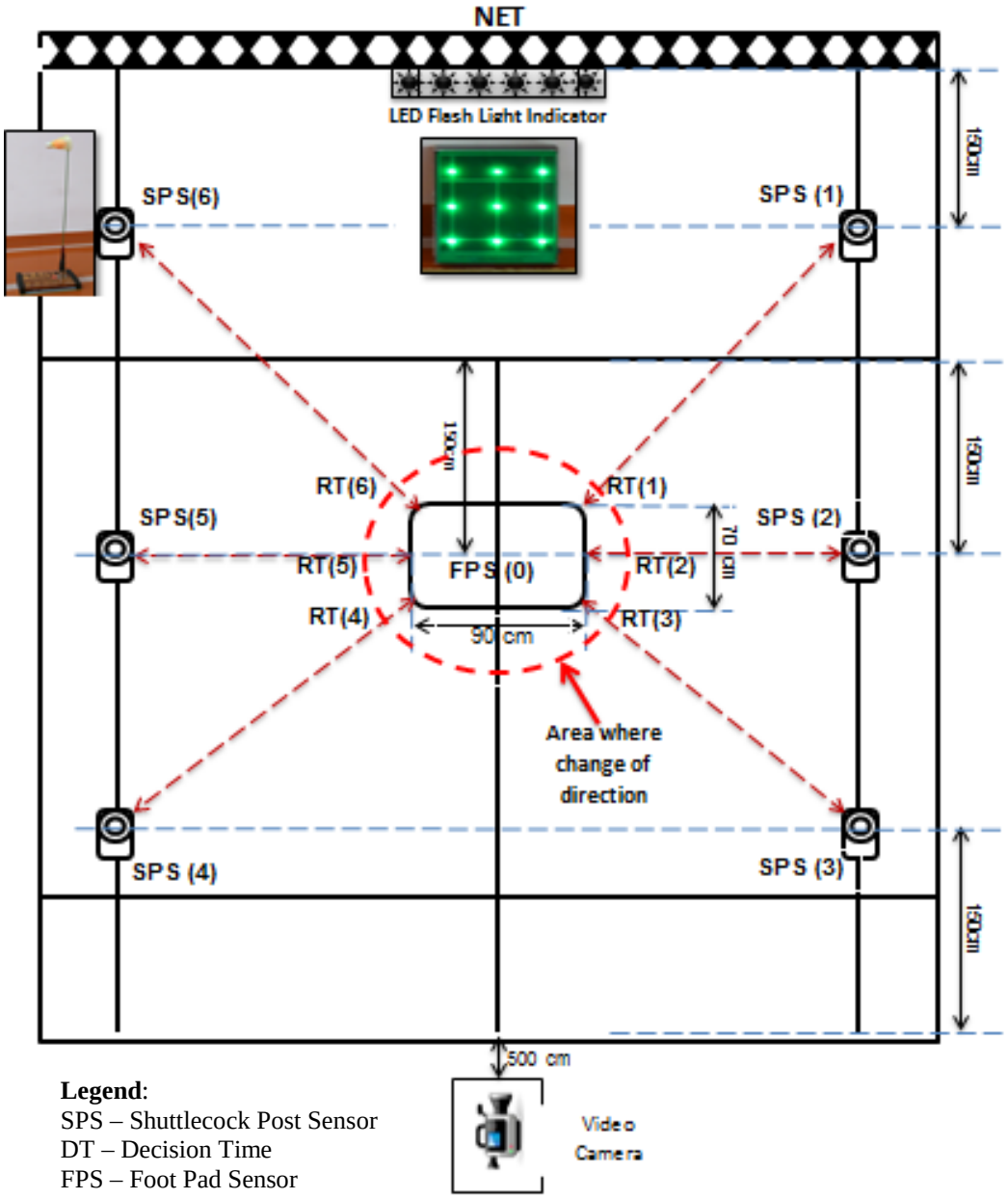
2. METHODS

2.1 Participants

Researcher has selected the male under 15 years' old badminton players and the coach (teacher) who coached the school's badminton team representing the schools, district, and state levels of Johor Bahru as participants as they have learned the basic skills of badminton at the age of 12.

2.2 Testing Setup

Part 1. Design Schematic illustration testing procedure using Badminton Reactive Agility Testing System (BRATS)



Legend:
SPS – Shuttlecock Post Sensor
DT – Decision Time
FPS – Foot Pad Sensor

2.3 Badminton Reactive Agility Test System (BRATS) Execution

Name of Test: Badminton Reactive Agility Test System (BRATS)
Purposes: To test badminton athlete Reactive Agility (RA) performance
Level: Badminton Players
Gender: Male and Female

Equipment:

1. Flashlight LED
2. Footpad sensor
3. Microcontroller-MC
4. Shuttlecock
5. Racket

Management and Organization:

1. A single test trial consisted of 6 point.
2. Single test trial was completed when the examinee touch the central footpad sensor point of the court with at least one of their feet after returning from the twelve program.
3. Two trials were performed using the same scenario, and after reliability analyses, the best score was retained as the final result.

Procedure:

1. The flashlight LED will light up randomly. The subjects began running from the central footpad sensor of the court when ready.
2. Timing began the moment each subject step the central footpad sensor.
3. When the subject step the footpad sensor, a hardware module (Microcontroller-MC) ignited 1 of the 6 LED lights placed on the indicator light badminton board.
4. The subjects had to assess which LED lit, and run to those particular corners, then swing the shuttlecock post with player hand holding the racket, and return to the central of the court as quickly as possible, which was marked by a 90cm x 70cm square, with at least one of their feet.
5. This is repeated until the completion of 6 repetitions (1 for each shuttlecock post).
6. The movements are based on the signal indicated (0-6-0-2-0-4-0-1-0-3-0-5-0).
7. The subject must return to the central base each time after completing a swing at each shuttlecock post sensor.

Name of Test: Changes of Direction Speed (CODS)
Purposes: To test badminton player Change of Direction Speed (CODS) performance
Level: Badminton Player
Gender: Male and Female

Equipment:

1. Flashlight LED
2. Footpad sensor
3. Microcontroller-MC
4. Shuttlecock
5. Racket

Management and Organization:

1. Performed on the same testing court as that for the (BRAT)

2. Throughout the test, the testing scenario was sequenced, and the subjects knew it in advanced.
3. Two trials were performed using the same scenario, and after reliability analyses, the best score was retained as the final result.

Procedure:

1. The timing began the moment each subjects step on the central footpad sensor on the central of the court.
2. The subjects ran as quickly as possible to corner shuttlecock post sensor 1 (programme 1), swing the shuttlecock post with players hand holding the racket and ran back to the central footpad sensor of the court.
3. This is repeated until the completion of 6 repetitions (1 for each shuttlecock post sensor).
4. The movements are based on the signal indicated (0-1-0-2-0-3-0-4-0-5-0-6-0). The subject must return to the central footpad sensor each time after completing a swing at each shuttlecock post sensor.

2.4 Validity and Reliability Assessment

Using expert validation report, badminton players' CODS and RA performances and coaches perception analysis (Fadhil, 2020), BRATS have been proven as a valid and reliable tools in order to measure CODS and RA among badminton players.

3. RESULTS

ANOVA was used to compare the differences between school, district, and state male badminton players under 15 years old in their performances of CODS and RA while using Badminton Reactive Agility Test System. Table 1 showed the differences between school, district, and state male badminton players under 15 years old in their performances of CODS and RA.

Table 1. The differences between school, district, and state male badminton players under 15 years old in their performances of CODS and RA

Performance aspects	Categories	N	M	SD	F	Sig.
Reaction time	State	10	4.17	0.78	3.245	0.047
	District	15	4.20	0.77		
	School	30	4.64	0.54		
Movement time	State	10	3.00	0.39	7.966	0.001
	District	15	3.58	0.66		
	School	30	3.85	0.58		
Movement back time	State	10	5.32	0.69	3.499	0.038
	District	15	5.91	0.80		
	School	30	6.09	0.80		
RA	State	10	12.51	1.04	9.150	0.000
	District	15	13.71	1.49		
	School	30	14.59	1.38		
CODS	State	10	10.80	0.85	8.849	0.000
	District	15	11.96	1.69		
	School	30	12.80	1.24		

4. DISCUSSION

In this current study, for CODS, state players scored 10.80 ± 0.85s reaction time. District players scored 11.96 ± 1.69s, while school players scored 12.80 ± 1.24s. Looking at CODS, significant differences existed for all the variables between all the groups ($p < 0.05$ for all comparisons). The significant differences reflect that the pre-planned movement can differentiate badminton players of different levels. Previous studies had shown that CODS is influenced by several factors. For example, (Draper and Lancaster (11)) in their study compared the relationship between Illinois agility test and 20-m sprint performance. What they found is that there is statistically significant moderate relationship between both tests. Thus, the strength, power and speed of the players were the possible contributors for the different performance achieved by the players of different levels.

In analysing RA, researchers had divide them into reaction time, movement time, and movement back time. For reaction time, state players scored 4.17 ± 0.78s. District players scored 4.20 ± 0.77s, while school players scored 4.64 ± 0.54s. For movement time, the state players also achieved faster time with 3.00 ± 0.39s compared to district (3.58 ± 0.66s) and school (3.85 ± 0.58s). For movement back time, the state players also achieved faster time with 5.32 ± 0.69s compared to district (5.91 ± 0.80s) and school (6.09 ± 0.80s).

In each every aspects of the RA, it seems that the state players were significantly faster than the other two groups ($p < 0.001$ for both) while the district players were faster compared to the school players, ($p < 0.001$). These thus brought to the fastest time performed by state players compared to the district and school players in overall RA time. The ability of BRATS to differentiate CODS and RA performances between state, district and school players showed that the test reflect on what should be obtained by BRATS.

5. CONCLUSION

Based on the achievements of badminton players, the achievements of badminton players can be measure more meaningfully as BRATS can distinguish badminton players by their level of performance; school, district and state.

6. ACKNOWLEDGEMENTS

Researchers would like to thanks the Sport Innovation and Technology Centre (SITC), Universiti Teknologi Malaysia for the research funding of this study. Special thanks also to the Research Management and Innovation Centre (RMIC), Universiti Pendidikan Sultan Idris for the funding support of this manuscript publication fees.

REFERENCES

1. Hughes M, Reilly T, Hughes M, Lees A. Physiological demands of training in elite badminton players. Science and racket sports. 1995:32-7.
2. Faude O, Meyer T, Rosenberger F, Fries M, Huber G, Kindermann W. Physiological characteristics of badminton match play. European journal of applied physiology. 2007;100(4):479-85.
3. Nadzalan AM, Mohamad NI, Lee JLF, Chinnasee C. Relationship between muscle architecture and badminton-specific physical abilities. Human Movement. 2018;19(1):44-50.
4. Jeffry MSBM, Mohamad NI. Physiological and biomechanical analysis of badminton players: a brief review. Jurnal Sains Sukan & Pendidikan Jasmani. 2013;2(1):9-16.
5. Abdullah MF, Janep M, Azzfar MS, Karim ZA, Rahmat A, Nadzalan AM. Playing pattern analysis of men's single badminton matches. International Journal of Engineering & Technology. 2018;7(2.15):168-70.
6. Manrique DC, Gonzalez-Badillo J. Analysis of the characteristics of competitive badminton. British journal of sports medicine. 2003;37(1):62-6.
7. Güçlüöver A, Demirkan E. The Comparison of Some Physical and Physiological Features of Elite Youth National and Amateur Badminton Players 1234. 2012.
8. Lees A. Science and the major racket sports: a review. Journal of sports sciences. 2003;21(9):707-32.
9. Abián P, Abián-Vicén J, Sampedro J. Anthropometric analysis of body symmetry in badminton players. Int J Morphol. 2012;30(3):945-51.

10. Campos FAD, Daros LB, Mastrascusa V, Dourado AC, Stanganelli LCR. Anthropometric profile and motor performance of junior badminton players. Brazilian Journal of Biomotricity. 2009;3(2):146-51.
11. Draper J, Lancaster M. The 505 test: A test for agility in the horizontal plane performance. Exerc Sport Sci Rev. 1985;31:8-12.
12. Young W, Farrow D. A review of agility: Practical applications for strength and conditioning. Strength and conditioning journal. 2006;28(5):24.
13. Sheppard J, Young WB, Doyle T, Sheppard T, Newton RU. An evaluation of a new test of reactive agility and its relationship to sprint speed and change of direction speed. Journal of science and medicine in sport. 2006;9(4):342-9.
14. Sheppard JM, Young WB. Agility literature review: Classifications, training and testing. Journal of sports sciences. 2006;24(9):919-32.
15. Cox RH. Sport psychology: Concepts and applications: McGraw-hill; 1998.