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THE CHANGE OF DIRECTION SPEED PERFORMANCE OF HEARING-IMPAIRED NETBALL PLAYERS

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The ability to change body direction in varying speed efficiently serves as an important attribute for netball players. It is also influenced by a variety of physical factors. This study aims to compare the change of directions speed (CODS) between young, hearing-impaired netball players and young, normal netball players. Seventy-five young, netball players (32 hearing-impaired – HI group, 43 normal netball players) aged 13 to 18 years (HI, M = 15.28 yr., SD = 1.35; Normal, M = 16.02 yr., SD = 1.2) underwent three CODS testing: T-Test agility, Zigzag agility test, and 505 agility tests. Results indicated significant performance differences between groups in which the younger HI netball players performed lower than the older HI netball players and the normal netball players. Postural stability and balance ability might have rendered the HI CODS performance, especially in the T-Test agility. Complexity of movement should be considered in selecting suitable CODS testing instrument for the HI population.

Keywords: Hearing-Impaired Netball Players, Change of Direction Speeds.

1. INTRODUCTION

Rio's Paralympic Games in 2016 marked glorious victories for Malaysia. Out of the nineteen participants, three won gold medals and one obtained a bronze (International Paralympic Committee [IPC] 2016). The success has demonstrated great achievement hence the need to increase support for future achievement. Accordingly, the National Sports Council has planned the pursuit of success, and now the public demands fair reward for the paralympic athletes' efforts, at par with that received by normal athletes.

The development of sports and games for people with disabilities (PWDs) in Malaysia has shown positive progress. Various sports competitions for individuals with disabilities have been held at national level, such as the biennial Sports Olympiad, National Disabled Sports Championship, and Sport Deaf Malaysia (Sukan Orang Pekak Malaysia SOPMA). These games have also contested women's team sport events that provide opportunities for hearing-impaired athletes to participate in active, high-intensity, and vigorous sports. Netball is among the sports contested in SOPMA (SOPMA, 2014).

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Netball is among the popular sports in Malaysia (Soh, Ruby, Soh, Mohd Sofian, Marjohan, 2009). It is a team sport that has received the highest number of participation from Commonwealth countries, such as the United Kingdom, Australia and New Zealand (Chandler, Pinder, Curran, Gabbett, 2014; Steele, 1990). In 2016, Malaysia's senior netball team stood first in Asia's ranking and nineteenth in the world's ranking (International Netball Federation, 2016). Malaysia's junior netball team was the champion (2013) and runner-up (2015) in Asian Youth Netball Championships. These achievements depict that the netball arena in Malaysia has involved a group of senior and junior players from various levels of achievement and competition.

Netball is categorized as a fast moving game that requires players to move with irregular intervals and through various directions in a space limited by the player's position (Fish and Greig, 2014). Each position has specific roles that require specific physical characteristics (Fish and Greig, 2014; Chandler, Pinder, Curran, Gabbett, 2014; Davidson, and Trewartha, 2008). Bock-Jonathan, Venter, and Bressan (2007) mention that netball is a dynamic and highly strategic game; it requires technical performance and tactical knowledge of players when playing hence demand individual physical quality.

Studies have shown that individuals with hearing impairment often

(a) avoid to participate in physical activity and

(b) choose easy activities (Bouffard *et al.*, 1996) that require low level of quickness, agility, and social interaction (Sandip and Sayanti, 2015).

Many studies have shown that compared to the normal group, the hearing-impaired group is at average to poor level of motor development and physical fitness performance (Al-Rahamneh, Dababseh and Eston, 2013; Livingstone and Mcphillips, 2011; Hartman, Houwen and Visscher, 2011; Rine, Cornwall, Gan, LoCascio, O'Hare and Robinson, 2000). Other studies have demonstrated that individuals with hearing impairment performed well on specific fitness components, such as muscle strength and power (Abdullah, Mohamed, Tumijan, Parnabas, Ponnusamy, Shapie, and Omar-Fauzee, 2016), flexibility (Al-Rahamneh, Dababseh and Eston, 2013) and oxygen consumption (Ellis and Darby, 1993; Ercan, Kilic, Savas, Acak, Býýýklý and Tore, 2016).

Most studies on individuals with hearing impairment have focused on the components of equilibrium (balance) that is due to the functional problem of the semi-circular canal in the inner ear and vestibular structures (Rajendran, and Roy, 2011). These structures are agents of postural stability, therefore their impairments will cause hearing problems. Studies on balance aspect have been carried out since 1960 (Elioz, Sitti, Koc, Murt, and Koc, 2013; Zdrodowska, Wiszomirska, and Kosmol, 2015; Güzel, Medeni, and Mahmut, 2016; Malekabadizadeh, Barati, and

Khorashadizadeh, 2016; Chang, Hsu, Ho, and Kuo, 2016; Ellis, and Darby, 1993; Rajendran, and Roy, 2011; Butterfield, 1986; Boyd, 1967), and the findings have indicated poor performance for this component.

Weakness in balance components contributes to the selection of a sedentary lifestyle of individuals with hearing problems, but most of these individuals are also

(a) physically actived and

(b) involved in sports competitions.

Hearing-impaired individuals have also participated in team sports such as basketball (Sobko, Kozina, Iermakov, Muszkieta, Prusik, Cieslicka and Stankiewicz, 2014), table tennis (Chang, Hsu, Ho and Kuo, 2016), soccer (Guzel, Medeni and Mahmut, 2016; Elioz, Sitti, Koc, Murt and Koc, 2013), handball (Vujkov, Dukic and Drid, 2010), as well as volleyball and softball (Ellis and Darby, 1993). Although the involvement of netball players with hearing impairment is under-reported (Atherton, 2007), some of the netball rules and regulation have been modified according to the needs of hearing-impaired players (Hickey, 2007), which indicates that this game is also the choice for this group, particularly among female athletes.

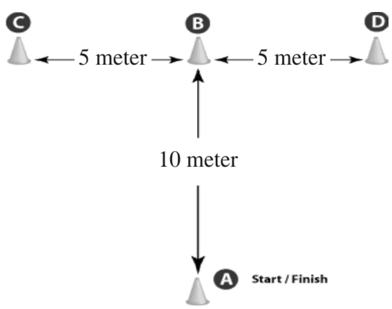
Nevertheless, studies on hearing-impaired athletes have mostly focused on the players' balance activity, and little research has been conducted on the players' other physical components. These individuals' participation in team sports indicate that they have to interact with team members and move according to the game situation. Situations of the game requires players either to slow down, speed up, or change the direction of movement to maintain the pace of the sport. Accordingly, the present study is conducted to analyze the change of direction speed (CODS) of young hearing-impaired netball players compared to that of young normal netball players.

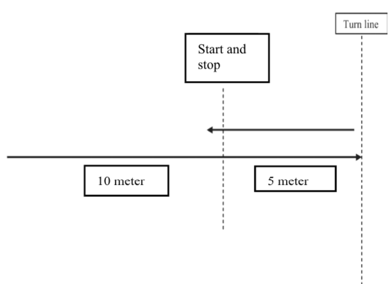
2. METHODOLOGY

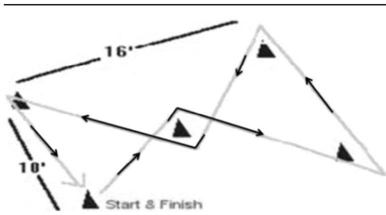
The present study involved 43 netball players without hearing impairment (normal group) aged 13 to 18 years (M = 16.02 yr., SD = 1.2) and 32 netball players with hearing impairment (HI group) aged 13 to 18 years (M = 15.28 yr., SD = 1.35). The HI group was attending a special school for the deaf in northern area of Malaysia and was actively involved in netball at school level. The thirteen netball players in the HI group were representing their school for higher-level competition. They were divided into four groups: hearing impairment under 15 years old (HIU15), hearing impairment under 18 years old (HIU18), normal under 15 years old (NU15) and normal under 18 years old (NU18).

All the netball players were required to undergo three agility tests that focused on change of direction speeds: T-test agility (Semenick, 1990), Zigzag agility test (Barrow, 1953), and 505 agility test (Sheppard and Young, 2006). Reliability test of the agility instrument was conducted and the interclass correlation coefficient (ICC) for the T-test agility (HI group, 0.843; normal group, 0.836); the Zigzag agility test (HI group, 0.932; normal group, 0.941); and the 505 agility test (HI group, 0.536; normal group is 0.685) were acceptable. These three tests have been widely used to measure agility performance of netball players; they involve running activities at horizontal plane of movement and no jumping activity at vertical plane of movement. The procedure of the brief agility test is described in Table 1. SPSS 16 was used to analyze the collected data. Descriptive statistics and one-way ANOVA with post-hoc comparison were employed for statistical analysis.

TABLE 1: BRIEF PROCEDURE OF AGILITY TEST

<table>
<tr><th>The Agility Test</th><th>Brief Procedures</th></tr>
<tr><td>

Agility T Test</td><td>Subject has to run forward from A to B and touch the cone, then lateral run to C and touch the cone, lateral run to D and touch the cone, and lateral run back to B and touch the cone, and run backward to A. Time is recorded.</td></tr>
<tr><td>

505 Agility Test</td><td>Subject has to run from 10 meter line and speed at 5 meter line, time is started and turned 180° and run to 10 meter line.</td></tr>
<tr><td>
</td><td>Time is stopped when subject pass the 5 meter line. Subject run to the cone as shown in the diagram. Time is recorded.</td></tr>
</table>

3. RESULTS AND DISCUSSIONS

Table 2 describes the four groups of subjects. The means and standard deviations indicate that the netball players of normal group are taller and heavier than those in the HI group. The normal netball players also performed better in the three agility tests compared to their counterpart.

TABLE 2: MEAN AND STANDARD DEVIATION OF DEMOGRAPHICAL DATA AND AGILITY TEST

Parameters	*HIU15 (n = 19)*	*HIU18 (n = 13)*	*NU15 (n = 12)*	*NU18 (n = 31)*
Age (year)	14.4 ± 0.76	16.56 ± 0.88	14.50 ± 0.67	16.62 ± 0.67
Weight (kg)	55.99 ±18.56	49.56 ± 8.29	57.17 ± 6.44	56.17 ± 7.88
Height (m)	1.57 ± 5.41	1.52 ± 4.00	1.65 ± 4.42	1.62 ± 7.67
T-Test Agility (sec.)	11.23 ±1.73	9.70 ± 0.87	7.04 ± 0.40	6.46 ± 0.53
Zigzag Agility Test (sec.)	9.56 ±1.24	8.85 ± 0.78	6.63 ± 0.42	7.30 ± 0.81
505 Agility Test (sec.)	3.38 ± 0.32	3.15 ± 0.17	3.13 ± 0.32	2.79 ± 0.28

* HIU15 (hearing impairment under 15 years old), HIU18 (hearing impairment under 18 years old), NU15 (normal under 15 years old) and NU18 (normal under 18 years old).

The one-way ANOVA statistical analysis reveals significant differences on height, T-Test agility, Zigzag test, and 505 agility test, but not on weight between groups. A post-hoc comparison showed that the HI groups (HIU15 and HIU18) recorded significant difference in the stated parameters compared to the normal group. As for the normal group, the NU15 group marked significant difference in the 505 agility test compared to the NU18 group, but no significant difference was marked in the T-Test agility and the Zigzag agility test. The ANOVA results are shown in Table 3.

TABLE 3: ONE-WAY ANOVA RESULT WITH POST-HOC COMPARISON

Parameters	*F*	*Sig*	*Tukey's HSD*
Height (m)	9.87	.000	HIU15 < NU15; HIU18 < NU15 and NU18
T-Test Agility (sec.)	101.35	.000	HIU15 > HIU18, NU15 and NU18; HIU18 > NU15 and NU18
Zigzag Agility Test (sec.)	38.76	.000	HIU15 > NU15 and NU18; HIU18 > NU15 and NU18
505 Agility Test (sec.)	18.58	.000	HIU15 > NU18; HIU18 > NU18; NU15 > NU18

* HIU15 (hearing impairment under 15 years old), HIU18 (hearing impairment under 18 years old), NU15 (normal under 15 years old) and NU18 (normal under 18 years old)

The younger, hearing-impaired netball players showed a lower level of change of direction speed (CODS) performance compared to other groups, especially in agility. The older, hearing-impaired netball players also showed a lower level of T-Test agility compared to the normal netball players. The T-Test agility involved three different direction of movement: running forward, lateral (side by side), and backward. The lower level of performance among the hearing-impaired netball players might be influenced by the complexity of the movement in the T-Test agility. The lateral and backward running requires the hearing-impaired players to maintain their postural stability and balance. According to Rajendran and Roy (2011), maintaining postural stability and balance is a complex process that demands the involvement of multiple systems, such as sensory and information processing systems. This complex process may render the CODS performance especially among individual with semicircular canals and vestibular problems.

Overall results indicate that the ability to accelerate, decelerate, and change direction in a very limited space and time requires continuous training. The older netball players with and without hearing impairment showed better performance compared to their younger counterparts in all three agility tests. Longer involvement in netball sports with a semi-structured training program has provided opportunity for the older players to develop other physical qualities that might contribute to their CODS performance. More chances to play netball have required the older players to run and

(a) jump horizontally (unilateral and bilateral) laterally and

(b) move backward closely to mimic the demands of a CODS ability (Brughelli, Cronin, Levin and Chaouachi, 2008).

4. CONCLUSION

To the authors' knowledge, CODS evaluation among hearing-impaired netball players and a comparison group with normal netball players has not been reported in Malaysia. The average height parameters in this study indicated that the hearing-impaired netball players are shorter than the normal netball players. The former also performed lower than the young, normal netball players in the three selected CODS tests. The movement direction that depends on postural stability and balance in the CODS testing instrument may have lessened the CODS performance of the hearing-impaired players. This study maintains that future CODS research should investigate, among others, the physical quality factor, the interrelation of postural stability and balance component, and the complexity of movement in CODS testing instrument.

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