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ORIGINAL RESEARCH

The Relationship Between Hearing Level and Speed and Speed of Linear Direction Change of Handball Players with Hearing Impairments

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Abstract

The aim of this study is to investigate the relationship between hearing level of hearing impaired female handball players with speed performance and linear change of direction (COD) times. 19 athletes of the Hearing Impaired National A women's handball team, which ranked second in the 2018 Deaf World, participated in the study voluntarily. The average age, height and body weight of the athletes are 22.63 ± 4.46 years, 165.26 ± 4.54 cm, 65.63 ± 2.03 kg, respectively. Body weights of the athletes were evaluated by an electronic scale with an accuracy of 0.1 kg, a digital length measuring device with a height of 0.01 cm and a speed and linear change of direction (Change of Direction and Acceleration Test-CODAT) of 20 meters with a Fusion Sport device. Hearing level measurement was applied by audiometry. The SPSS 19.0 package program was used to analyze the data, and the correlation coefficients and statistical significance of the variables were calculated with the Pearson Correlation Test. In our study, a low and moderate positive correlation was found between the level of hearing loss and 20m speed and COD performance ($p < 0.05$). As a result, hearing loss level of deaf athletes affects speed and direction change performance. Many additional studies are needed to improve the sports performance of deaf athletes. It is considered that the study will contribute to this field.

Keyword: handball, hearing impaired, speed, change of direction.

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INTRODUCTION

Hearing impaired individuals generally avoid interaction due to preferring to live in their own environment; communicating with each other through sign language and the other individuals in the society not knowing sign language or having very little knowledge about it (Gür, 2001). Similarly, they do not wish to participate in sports activities with other athletes who develop normally (Dursun et al., 2015). Hearing impaired athletes do not experience any kind of physical lack and can participate in competitive sports without any limitations. The communications barriers related to hearing is the only factor which separates them from the other athletes (Kurková et al., 2011). However, this factor affects these individuals negatively. Early diagnosis is of vital importance in terms of the continuity of the social lives of hearing impaired individuals. Early participation in sports activities which are the most important tool of social life is an important factor for these individuals in terms of improving their quality of life (Doğu, 2017).

Hearing impairment depends on numerous factors such as the type and degree of hearing loss which is effective in the performance of the individual with hearing impairment, the age in which the impairment begins, the family's ability to cope with the impairment, the child's intelligence level, language skills and educational experiences (Meyen and Skrtic, 1995). Compared to the normal group, individuals with hearing impairments in average have weak motor development and physical fitness performance (Ibrahim et al., 2017). Children with hearing impairment have weaker balance and agility compared to normal children (Metgud and Topkar, 2019).

Handball is a type of sports which involves explosive sprints, jumps, direction changes, passing the ball and body contact while doing these (Marques, 2009) and in which speed and agility are important. The basic movement patterns of team sports require athletes to make sudden changes in body movements and move their joints faster and these movements depends on their skill in doing them, visual processing, reaction time, perception and other factors. The ability to move in different directions in all sports types is more important than sprinting from a flat line (Šımonek et al., 2017).

There are many organizations and activities carried out in our country and the world for the participation of handicapped individuals in sports and being competitive. For athletes with hearing impairment, Deaf Olympics is organized every 4 years, Hearing Impaired World Championships every 2 years and Hearing Impaired European Championship every 2 years when it does not coincide with the Hearing Impaired World Championship. The purpose of this study is to analyze the relationship between the hearing level and speed performance and linear direction change of Hearing Impaired National A women's handball team who ranked second in the 2018 Deaf World.

METHOD

Nineteen female athletes with an average age of 22.60 ± 4.46 years, average height of 165.26 ± 4.54 cm, average body weight of 65.63 ± 11.18 kg and average BMI of 24.05 ± 4.13 years participated voluntarily in the study (Table 2). 19 athletes of the Hearing Impaired National Senior Women's Handball Team, which ranked second in the 2018 Deaf World, participated in the study voluntarily. Athletes were recruited if they: were currently active in Turkey handball (in the hearing impaired league) competition; had a general field sport training history at least 2 trainings per week) extending over the previous 12 months; did not

have any existing medical conditions that would compromise participation in the study; and were available for all testing occasions. The athletes were given detailed information about the study, asked to fill in the "informed consent form" and their consent was taken. The study procedures were carried out in accordance with the ethical standards of human researches of the Helsinki Declaration 2008 Principles.

A familiarization session was conducted 48 hours prior to the first testing session. Two testing sessions were then completed by all subjects, also separated by 48 hours (Sheppard et al., 2006). Prior to data collection in the first testing session, each subject's age, height, weight, body mass index (BMI) were recorded. Then, hearing level (sensitivity) was measured. This measurement was done with the audiometer device. This device allows measuring sensitivity to pure sound and speaking sounds. The test applied with earphones shows the "air conduction" level. "Bone conduction" levels are determined by holding a small vibrator attached to the same audiometer tightly on the skull and usually on the mastoid Process. The vibrations on the device are transmitted to the skull, omit the middle ear through the external ear and directly reach the inner ear.

Table 1. Classification of Hearing Loss

The lightest sound the individual can perceive	**Classification of sound**
20 dB or lighter	Normal hearing
25 dB or stronger	Slight hearing loss
45 dB or stronger	Medium level hearing loss
65 dB or stronger	Advanced level hearing loss
85 dB or stronger	Full hearing loss

Finally, for linear direction change measurement, Change of Direction and Acceleration Test (CODAT), and 20 m Speed Test was applied for speed measurement of the athletes

20 m Speed Test

Speed was measured with the 20m Speed Test (sec). The athletes were given a sufficient rest period and ran 20 m at maximum speed with the start sign. The time between start and end was recorded. Two trials were carried out and the best result was recorded (Lockie et al., 2013).

Change of Direction and Acceleration Test (CODAT)

Linear change of direction was measured with the Change of Direction and Acceleration Test (CODAT). The dimensions and movement direction for the CODAT is shown in Figure 1. The CODAT involves a straight 5-m sprint, followed by three 3-m sprints. These 3-m sprints are made at angles of 45° and 90°. Following the third 3-m sprint, there is a straight 10- m sprint to the finish line. The athletes were instructed to complete the test as quickly as possible. The athletes were also to ensure that they cut around markers and did not run over them. Trials were stopped and reattempted after the rest period if the subject did cut over the top of a marker, so that two successful trials were completed. Two trials were carried out, a sufficient rest period was given between trials and the best result was recorded (Lockie et al., 2013).

Data Analysis

In the analysis of the data, the SPSS 19.0 software was used; the mean standard deviation, maximum and minimum values were determined, and Pearson Correlation test was used to determine the correlation coefficients and statistical significance of the variables.

FINDINGS

In this section psychological resilience levels based on the gender variable are presented in tabular for the objective of the study.

Table 2. Test Results of the Athletes

		Hearing Loss (dB				Measurement			Test	
No	**Age**	**Right (Air)**	**Right (Bone)**	**Left (Air)**	**Left (Bone)**	**Height (cm)**	**Weight (kg)**	**BMI (kg/m2)**	**COD (sec)**	**20m speed (sec)**
1	34	108	67	112	67	163.4	64.4	24.1	7.11	3.20
2	27	107	66	114	66	160.3	59.3	23	6.07	2.70
3	28	117	67	118	67	160.1	58.4	22.7	6.32	2.95
4	24	120	67	120	67	174.8	75.7	24.8	6.74	2.54
5	25	108	66	109	67	160.4	56.4	21.9	6.15	2.66
6	16	73	68	80	70	170.2	78.3	27	6.07	2.45
7	28	103	70	102	70	168.9	59.7	20.9	6.53	2.81
8	18	107	70	108	70	163.5	71.1	26.7	6.56	2.56
9	19	93	67	100	66	161.4	48.7	18.5	5.63	2.28
10	20	94	66	99	65	169.4	65.2	22.8	5.63	2.19
11	21	96	70	105	69	170.3	66.1	22.8	5.61	2.23
12	19	92	70	97	70	161.6	63.3	24.3	6.54	2.41
13	20	115	70	92	70	164.1	87.0	32.3	7.03	2.97
14	19	110	70	106	70	159.7	75.7	29.7	6.99	2.57
15	19	101	71	103	69	165.6	61.3	22.4	6.59	2.86
16	25	105	70	105	68	167.3	63.7	22.6	6.34	2.81
17	23	109	69	98	71	170.8	64.8	22.1	6.67	2.42
18	24	110	66	115	64	171.3	47.6	16.1	5.88	2.51
19	21	68	63	67	63	165.4	88.3	32.3	6.6	2.73
Min.	16	68	63	67	63	159	47.4	16.01	5.61	2.62
Max.	34	120	71	120	71	164	88.8	32.3	7.11	2.16
Mean	22.6	101.89	68.47	102.63	67.84	165.26	65.63	24.05	6.37	3.2
S.D.	4.46	13.55	2.43	12.84	2.31	4.54	11.18	4.13	0.46	0.26

According to the results of the analysis, there is a medium level positive correlation between the linear direction change times of handball players and the right ear (air); a low level positive relationship in the right ear (bone); a low level positive relationship in the left ear (air) and a medium level positive relationship in the left ear (bone) ($p<0.05$). A low relationship was determined between the linear direction change time and body height; and a medium positive relationship between body weight and BMI ($p<0.05$). A medium level positive relationship was determined between 20m speed and the right ear (air); low level positive relationship in the right ear (bone); low level positive relationship in the left ear (air) and low level positive relationship in the left ear (bone) ($p<0.05$). A medium level correlation was determined between 20m and body height and a low level positive correlation between body weight and BMI ($p<0.05$).

Table 3. The relationship between the hearing levels of the athletes and physical characteristics

		Age (years)	**Height (cm)**	**Body weight (kg)**	**BMI (kg/m2)**	**Right ear (air)(dB)**	**Right ear (bone)(dB)**	**Left ear (air)(dB)**	**Left ear (bone)(dB)**
COD (sec)	r	0.223	0.165*	0.522*	0.579*	0.319*	0.277*	0.029*	0.391*
	p	0.561	0.047	0.008	0.005	0.033	0.048	0.049	0.003
20m speed (sec)	r	0.61	0.326*	0.149*	0.252*	0.332*	0.034*	0,13*	0.017*
	p	0.122	0,031	0.044	0.039	0.029	0,046	0.43	0.049

*p<0.05

DISCUSSION

In our study, a low and medium level positive correlation was found between hearing loss level and 20m speed and COD performance. While it is seen in other studies that the physical development of in particular children with hearing impairments is not different from the peers with no hearing impairments and that hearing impairment does not affect their physical development, it has been shown that hearing impairment in adults is related to weak physical functionality compared to individuals with normal hearing problems (Li et al., 2012). It is considered that this hearing loss results from cognitive load, social isolation and the individuals not being aware of the hearing environment (Gispen et al., 2014). In addition, as a result of damage in the mastoid bone located behind the earlap, balance problems in the development period of some individuals with hearing impairments (Sarı 2002). It is known that there is a relationship between balance and direction change speed (Miller et al., 2006, Delextrat et al., 2015, Hammami et al., 2017) A low and medium level correlation was found between all direction change tests and balance (Sekulic et al., 2014). During a body movement, balance is needed to preserve the body position, increasing speed and slowing down, sudden place and direction changes. It is known that there is a relationship between hearing level and balance and that balance is needed in numerous motor performances such as increasing speed, slowing down, sudden stops and direction changes (Malina, 1999).

Açak et al. (2012) compared the agility and visual reaction time of futsal players and determined a significant difference between athletes with full hearing loss and those who hear with hearing aids in terms of the agility test values of the study group in the identification of handicap level. This result shows that there is a difference in the agility parameter of the individuals with hearing impairments in terms of handicap level. The researchers expressed that the well-being in the physical values of the athletes with hearing impairments affect sportive performance and that hearing loss is not an advantage or a disadvantage.

İbrahim et al. (2017) in their study on netball players (14.4 ± 0.76 years: 16.56 ± 0.88 years) and netball players with hearing impairments (14.50 ± 0.67 years: 16.62 ± 0.67 years) determined that normal athletes have a lower COD time compared to athletes with hearing impairments. Preserving postural stability and balance is a complex process with requires multiple systems such as sensory and information processing systems. This complex process negatively affects COD performance and individuals with semicircular canal and vestibular problems (Rajendran and Roy, 2011). The vestibular system has an extremely important place in the postural mechanism and muscle control. Problems in balance and muscle control which arise due to the vestibular systems being affected in individuals with hearing impairments negatively affect muscle strength and motor functions (Horvat, 1990). It was shown that individuals with hearing impairments in average have weak motor development and physical fitness performance level in comparison to the normal group (Ibrahim et al., 2017). Children with hearing impairments have weak balance and agility compared to normal children (Metgud and Topkar, 2019).

CONCLUSION

As a result, there is a relationship between hearing loss level and direction change performance in athletes with hearing impairments. Studies on athletes with hearing impairments are in general related to balance and physical components and studies on

hearing loss level, speed and direction change time are quite limited. Further additional studies are needed to develop the sports performance of athletes with hearing impairments. It is considered that this study will contribute to this field.

REFERENCES

Açak, M., Karademir, T., Taşmektepligil, Y. & Çalışkan, E. (2012). The Examination of Agility and Visual Reaction Values of Hearing-Impaired Futsal Sportsmen. *Selcuk University Journal of Physical Education and Sport Science, 14*(2), 283-289.

Delextrat A, Grosgeorge B, Bieuzen F. (2015). Determinants of Performance in a New Test of Planned Agility for Young Elite Basketball Players. *International Journal of Sports Physiology and Performance, 10*(2), 160-5.

Doğu, G.A. (2017). İşitme Engelli Elit Sporcularda Yaşam Kalitesi. *Uluslararası Güncel Eğitim Araştırmaları Dergisi, 3*(2), 57-67.

Dursun, O.B., Erhan, S.E., Ibis, E.O., Esin, I.S., Keles, S., Sirinkan, A. (2015). The Effect of Ice Skating on Psychological Well-Being and Sleep Quality of Children with Visual or Hearing Impairment. *Disability and Rehabilitation, 37*(9), 783-789.

Gispen, Ms, David S. Chen, Bs, Dane J. Genther, Md, and Frank R. Lin, Md. (2014). Association between Hearing Impairment and Lower Levels of Physical Activity in Older Adults, *Jags*, 1-7.

Hammami R, Granacher U, Pizzolato F, Chaouachi M, Chtara M. (2017). Associations between Change of Direction, Balance, Speed, and Muscle Power in Prepubescent Soccer Players. *Journal of Athletic Enhancement, 6* (6), 2-6.

Gür, A. (2001). The Role of Sports Activities in the Social Adaptation Process of the Disabled. Ankara: Publication of the Republic of Turkey Prime Ministry Administration for Disabled People.

İbrahim, H., Nor, N.E.M., Hashim, A.H.M. & Zainuddin, Z.A. (2017). The Change of Direction Speed Performance of Hearing-Impaired Netball Players. *Man in India, 97* (13), 195-203.

Kurková, P., Válková, H. & Scheetz, N. (2011). Factors Impacting Participation of European Elite Deaf Athletes. *International Journal of Sports Science, 29*, 607-618.

Li L, Simonsick Em, Ferrucci L. et al. (2012). Hearing Loss and Gait Speed among Older Adults in the United States. *Gait Posture, 38*, 25–29.

Lockie, R.D., Schultz, A.B., Callaghan, S.J., Jeffriess, M.D. & Simon, P. (2013). Reliability and Validity of a New Test of Change of Direction Speed for Field-Based Sports: The Change Of Direction and Acceleration Test (Codat). *Journal of Sports Science and Medicine, 12*, 88-96.

Malina, R.M. (2000). Growth and maturation: do regular physical activ- ity and training for sport have a significant influence? In: Paediatric Exercise Science and Medicine, N. Armstrong and W. van Mechelen (Eds.). Oxford: Oxford University Press.

Marques, M., Van Den Tillaar, R., Gabbett, T., Reis, V. M., González-Badillo, J. J. (2009). Physical Fitness Qualities of Professional Volleyball Players: Determination of Positional Differences. *The Journal of Strength & Conditioning Research, 23*(4), 1106–1111.

Metgud, D.C. & Topkar, P. (2019). Balance and Agility Testing in Normal and Hearing-Impaired Children: A Case-Control Study. *Indian Journal of Physical Therapy and Research, 1*, 42-6.

Meyen, E.L. & Skrtic, T.M. (1995). Special Education Student Disability. Denver, Colorado: Love Publishing Company.

Miller Mg, Herniman Jj, Ricard Md, Cheatham Cc, Michael Tj. (2006). The Effects of a 6-Week Plyometric Training Program on Agility. *Journal of Sports Science & Medicine, 5*(3), 459-65.

Rajendran, V. & Roy, F.G. (2011). An Overview of Motor Skill Performance and Balance in Hearing Impaired Children. *Italian Journal of Pediatrics, 37*(33), 1-5.

Sekulic D, Spasic M, Esco Mr. (2014). Predicting Agility Performance with Other Performance Variables in Pubescent Boys. A Multiple-Regression Approach. *Perceptual and Motor Skills, 118*(2), 447-61.

Sheppard, J. & Young, W. (2006). Agility Literature Review: Classifications, Training and Testing. *Journal of Sports Sciences, 24*(9), 919-932.

Šimonek, J., Horička, P., & Hianik, J. (2017). The Differences İn Acceleration, Maximal Speed and Agility between Soccer, Basketball, Volleyball and Handball Players. *Journal of Human Sport and Exercise, 12*(1), 73-82.