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Muscle Strength and Flexibility without and with Visual Impairments Judoka's

Onder Karakoc[1]

[1] School of Physical Education and Sport, Gaziantep University, Turkey

Correspondence: Onder Karakoc, School of Physical Education and Sport, Gaziantep University, Turkey. Tel: 90-505-370-5256. E-mail: onderkarakoc@hotmail.com

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Abstract

The aim of this study was to examine muscle strength and flexibility of Judoka with and without visual impairments. A total of 32 male national judoka volunteered to participate in this study. There were 20 male judoka without visual impairments (mean±SD; age: 19.20±5.76 years, body weight: 66.45±11.09 kg, height: 169.60±7.98 cm, sport age: 6.20±1.15 years). There were 12 male judoka with visual impairments (mean±SD; age: 24.50±4.06 years, body weight: 75.58±22.49 kg, height: 173.50±7.23 cm, sport age: 8.08±1.44years). Judoka were also assessed on several strength measurements including standing long jump, right hand grip, left hand grip, vertical jump, leg strength, sit-up and push up, and flexibility with sit and reach. We found significant differences between with and without visual impairments in leg strength, left and right hand grip and push-up ($p<0.05$). On the other hand, there was no significant difference between with visual and without impairments in vertical jump, sit-up, flexibility, and standing long jump ($p>0.05$). In conclusion, it is considered that visual impairment issue does not have negative effects on physical development and muscle power performance levels for ones doing judo sport because elite active athletes' training levels are close to each other.

Keywords: Judoka, flexibility, muscle strength

1. Introduction

According to data from World Health Organization (WHO), approximately 39 million of 285 million people is visually impaired and on the blindness threshold. International classification for visual diseases was revised and four basic groups were based. These are stated as normal visually impaired, moderate visually impaired, severe visually impaired and blindness (WHO, 2014). In blindness situation, postural problems, weakness in physical activities, orientation difficulties, depression and balance problems are seen (Colak, 2004). When compared to the motor development, visually impaired children are different from normal children quantitatively and qualitatively. This is valid for both their gross motor skills and small motor skills (Helders, 1982; Houwen, Visscher, Lemmink, & Hartman, 2008; Norris, Spaulding, & Brodie, 1957; Tröster, 1993; Vervloed, 1996). Visually impaired individuals need more support in their physical and psychological development. When normal individuals and visually impaired individuals are compared, development is slower in individuals with visual impairment (Lieberman, 2001). Exercise is a breaking point for a healthy life. Disabled children need to participate in these exercises actively (Wilson, 2002). Judo is an Olympic sport which requires a high level in terms of techniques, tactics and physical feasibility (Little, 1991). For success in judo, dynamism, techniques and tactics with complex skill features have an important role (Callister et al., 1991). Cardiovascular endurance, muscle endurance, flexibility and balance are lower in visually impaired individuals rather than normal individuals (Skaggs, 1996). For visually impaired individuals, judo is among Paralympic Sports dating from 1988 Seul Games. Trainers cannot apply traditional training methods (i.e. randori and uchikomi) for visually impaired individuals doing judo (Gutiérrez-Santiago, 2012). According to visual rating of all athletes provided by the International Blind Sports Federation (IBSA), visually impaired classifications are made as B1, B2 and B3. But this division cannot be performed in practice since all judoka must compete without considering visually impaired classifications under the regulation of IBSA (Gutiérrez-Santiago, 2012). Because of the number of athletes, any division cannot be observed in visually impaired classifications in judo branch. Also, an excellent condition, physical endurance and a high level of muscle power play important roles for achieving in international championships (Franchini, 2011). Little information is available about judo with visual impairment

and judo without visual impairment. Researching and learning differences in physical, mental and motor development levels of disabled individuals and non-disabled individuals have a significant role in terms of training plans. So, the aim of this study is to examine muscle strength and flexibility of judoka with and without visual impairments.

2. Materials and Methods

A total of 32 male national judoka volunteered to participate in this study after having all risks explained to them before the investigation. There were 20 male judoka without visual impairments (mean ± SD; age: 19.20±5.76 years, body weight: 66.45±11.09 kg, height: 169.60±7.98 cm, sport age: 6.20±1.15 years). There were 12 male judoka with visual impairments (mean±SD; age: 24.50±4.06 years, body weight: 75.58±22.49 kg, height: 173.50±7.23 cm, sport age: 8.08±1.44years). All with visual impairments had B3 of sport classifications. B3 classification refers to those who have a visual acuity of 20/600 to 20/200 after best correction in the better eye or a visual field of less than 20 degrees and more than 5 degrees in the better eye, or both (that is, legal blindness) (Hand, 2006).

The participants' heights were measured with an instrument sensitive to 1 mm. Their body weights were measured with participants dressed in only shorts (and no shoes) with a weight-bridge sensitive up to 20 g.

Vertical Jump: Counter-movement vertical jump height (cm) was measured using a vertical jump mat and belt (Takei Jump Meter, Japan). Participants were instructed to keep their hands on their hips at all times and were permitted up to two trials (>15 seconds of recovery) to practice jumping technique followed by two recorded jumps.

Sit up: Boys laid on their backs with knees flexed at a right angle and with hands on the back of the neck. A tester kept the participants' heels in contact with the floor. For 30 seconds, participants continually sat up to touch their knees with their elbows.

Push-up: Participants supported themselves on the palm of his left or right hand with placed on the floor. Their hands were placed approximately 2 shoulder widths apart. Their back and legs were held straight, and their body was supported on the toes. Upon the command ''go,'' the participant lowered himself toward the ground until his elbows were bent at 90°. The participant then forcefully pushed himself back up with complete extension of the arms, while shifting the hand on the ground across to the new position on the floor. The participant moved across and back for a period of 30 seconds. The researcher recorded the maximum number of repetitions completed in the designated time period. A hand stopwatch was used for to record the duration of each trial.

Standing Long Jump: The participant stood behind the starting line with feet together, pushed off vigorously and jumped forward as far as possible. The distance was measured from the take-off line to the point where the back of the heel nearest to the take-off line landed on the mat or non-slippery floor. The test was repeated twice, and the best score was retained (in cm).

Hand grip strength: Hand grip strength was measured using a dynamometer (Takei Dynamometer) at trials 1 and 2 with midlife strength determined as the average of the best results in these 2 trials.

Leg strength: Leg strength was determined using an electronic dynamometer (Takei Scientific Instruments Co., Ltd, Niigata, Japan) with standardized protocols. The participants put their feet on the dynamometer with their knees bent 130–140°. They held the handle in a stretched position, and the chain was fixed to form the desired knee angle. The measurement was taken when the participant stretched the legs slowly but powerfully up without using the muscles on the back. The test was performed twice, interrupted with a 1-minute break; the best result achieved was recorded.

Sit and reach test: Sit and reach test was performed using the procedures outlined in ACSM manual (ACSM, 2000). A standard sit and reach table was placed on the floor, by placing tape at a right angle to the 38 cm mark. The participant sat on the floor with shoes on, and fully extended one leg so that the sole of the foot was flat against the end of the table. Participant then extended her/his arms forward, placing one hand on top of the other. With palms down, participant reached forward sling hands along the measuring scale as far as possible without bending the knee of the extended leg. Throughout testing, trainer checked to ensure that the heel remained at the 45 cm mark. Three trials were performed on one side; then the participant changed leg position and repeated the procedure on the other side. The average of the three trials on each side was used for subsequent analyses.

Statistical Analysis: Dependent variables for raw data were calculated as means and SD. Differences between with and without visual impairment in muscle strength and flexibility measurements were then determined by independent t test. An alpha level of 0.05 was used as significance level for all analyses. Statistical analyses were conducted in SPSS (15.0; SPSS, Inc., Chicago, IL).

3. Results

Table 1. Means and standard deviations (SD) for Judokas with and without visual impairments

Variables	Without visual impairments (N=20)	With visual impairments (N=12)
	Mean ± S.D	Mean ± S.D
Age (years)	19.20 ± 5.76	24.50 ± 4.06
Height (cm)	169.60 ± 7.98	173.50 ± 7.23
Weight (kg)	66.45 ± 11.09	75.58 ± 22.49
Sport age (years)	6.20 ± 1.15	8.08 ± 1.44

Table 2. Means and standard deviations (SD) for muscle strength in Judokas with and without visual impairments

Variables	Without visual impairments (N=20)	With visual impairments (N=12)
	Mean ± S.D	Mean ± S.D
Leg strength (kg)	132.10 ± 31.92	173.58 ± 22.49
Standing long jump (cm)	2.25 ± 0.31	2.42 ± 0.22
Right hand grip strength (kg)	40.70 ± 9.26	46.67 ± 5.65
Left hand grip strength (kg)	39.37 ± 9.07	46.00 ± 5.86
Flexibility (cm)	4.15 ± 5.63	6.50 ± 2.88
Vertical jump (cm)	38.05 ± 7.25	41.25 ± 5.86
Push up (repetitions)	26.35 ± 5.54	34.50 ± 7.00
Sit-up (repetitions)	25.75 ± 3.55	28.17 ± 3.88

Table 3. Comparison of muscle strength and flexibility according to with and without visual impairments

Variables		Mean ± SD	T	P
Leg strength (kg)	Without visual impairments	132.10 ± 31.92	-3.942	0.000*
	With visual impairments	173.58 ± 22.49		
Standing long jump (cm)	Without visual impairments	2.25± 0.31	-1.713	0.098
	With visual impairments	2.42 ± 0.23		
Right hand grip strength (kg)	Without visual impairments	40.70± 9.26	-2.264	0.031*
	With visual impairments	46.67 ± 5.65		
Left hand grip strength (kg)	Without visual impairments	39.37 ± 9.07	-2.511	0.018*
	With visual impairments	46.00 ± 5.86		
Flexibility (cm)	Without visual impairments	4.15± 5.63	-1.558	0.130
	With visual impairments	6.50± 2.87		
Vertical jump (cm)	Without visual impairments	38.05± 7.25	-1.365	0.183
	With visual impairments	41.25± 5.86		
Push up (repetitions)	Without visual impairments	26.35± 5.54	-3.439	0.003*
	With visual impairments	34.50± 7.00		
Sit-up (repetitions)	Without visual impairments	25.75± 3.55	-1.760	0.093
	With visual impairments	28.17± 3.88		

*P<0.05.

As shown in Table 3, we found significant differences between with and without visual impairments in leg strength, left and right hand grip and push-up ($p<0.05$). On the other hand, there was no significant difference between with and without visual impairments in vertical jump, sit-up, flexibility, and standing long jump ($p>0.05$).

4. Discussion

In this study, comparisons of parameter results were analyzed in muscle power of visually impaired and non-visually impaired male athletes included in judo branch as active athletes. When compared to the test results of performances related with muscle power of visually impaired and non-visually impaired male athletes participated in the study, statistically significant differences were seen ($p<0.05$). However, there was no significant difference in long jump steadily, vertical jump and 30 seconds shuttle test measurement values of non-disabled male athletes ($p>0.05$). In a study by Çalıskan et al. (2011), a high level of muscle intensity could not be observed in body fat percentages of visually impaired children. In their physical and motor skill development, improvements were obtained with exercises. Small motor skills of visually impaired children aged sixteen were compared and their physical performances were found slower rather than normal children (Smits-Engelsman, 2003). For a high performance in judo championships, physical feasibility and anthropometry values considerably take an important place (Sikorski, 1987; Thomas, 1989). Our study represented a visually impaired group who has done judo sport, were older and kept on long-term trainings, and whose muscle power was significantly well. A study which compared grip strength in children indicated no significant difference between disabled and non-disabled groups (Ellis, 2000). On the other hand, the other studies (Hartman, 2007; Şirinkan, 2010) revealed some significant differences between two groups. Franchini (2005) found average of right hand paw strength as 51.01±10.0 kg, average of left hand paw strength as 49.01±10.0 kg in elite judoka, average of right hand paw strength as 42.01±11.0 kg and average of left hand paw strength as 40.01±10.0 kg in non-elite judoka in their study. Within the studies mentioned above and our study, similar values were observed in the results of test values among visually impaired individuals. Since they performed judo sport, their hand grip strength was close to elite judoka. According to the research by Dias, judoka and non-judoka were evaluated in paw strength test. As a result of the tests, there was no difference in maximal power regarding hand grip values in favor of judoka but their resistance to tiredness was better (Dias,2012). In judo from defense sports, one of the basic principles is balance control. For breaking balance, holding techniques called kumi-kata are applied in contact with a competitor. For having superiority, a competitor must be ready for the position before starting techniques. For a better kumi-kata, hand grip strength must be very well. There are some researchers studying about long grip capability of judoka (Franchini, 2005). Franchini found leg power average in international judoka as 185.1±25 kg, leg power average in national judoka as 166±32.7 kg and leg power average in recreational judoka 140±36 kg (Franchini, 2011). Since elite judo athletes had great arm and leg circumferences, their muscle power was considered to be very high (Sacripanti, 1989). Sbriccoli studied about Italian Olympics judo athletes and stated that their muscle power was at a high level and their aerobic capacity was considerably great (Sbriccoli, 2007). A study by Franchini indicated that technical and tactical trainings for judo athletes were very significant for enlarging arm circumference, developing anaerobic power in general and anaerobic power specific to do judo (Franchini, 2005). Kubo et al. researched that judo athletes had muscle thickness at different levels as well as fat free weight differences (Kubo et al., 2006). Our study's difference was that visually impaired individuals performing judo at an elite level generally had better muscle power due to regular trainings. When disabled and non-disabled groups' physical and physiological characteristics were compared in one study, there were differences about body weight, back strength, leg strength, vertical jump and aerobic power in favor of non-disabled ones and about the measurements of height averages in favor of disabled group (Işık, 2013). Judo can be used as an education system, a recreational activity as well as a therapy for disabled ones by being modified (Caouette, 1991). Boyd stated that disabled and non-disabled children's motoric characteristics showed significant differences depending on age (Boyd, 1967). When we looked at studies in literature, some studies found results in favor of disabled groups even though results were generally in favor of non-disabled groups. This variety in literature studies was not seen in our study. A significant difference was found in parameters of leg strength, paw strength of right and left hands and thirty seconds push-up test values in favor of disabled male judo athletes. This difference in the disabled group can be related with different training programs performed regularly. When we compared our study's results with the results of other studies, the difference was that disabled athletes included in our study had become sportsmen actively and at an elite level, and the averages of sportive ages were higher in disabled judo athletes. Also, it could be resulted from their exposure to regular nutrition and scientific training programs. In conclusion, it is considered that visual impairment issue does not have negative effects on physical development and muscle power performance levels for ones doing judo sport because elite active athletes' training levels are close to each other.

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