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Relational assessment of motor skills in childhood judokas

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Abstract

This study examined the relationships between critical motor performance criteria such as anaerobic power, flexibility, and 20-meter sprint speed among 18 judokas aged 8-12 (11 boys, 7 girls). The aim was to better understand the role of gender in motor performance in judo and to gain insights for developing gender-specific training programs. Participants underwent various motor performance tests (anaerobic power, flexibility, and 20-meter speed). In the study, the SPSS 23 software package was used to determine the demographic characteristics of the participants, such as age, height, weight, and body mass index, with mean and standard deviation values. The normality of the data distribution was assessed using the Shapiro-Wilk test, and the Pearson correlation test was used to evaluate the relationship between motor performance data ($p<0.05$).The findings indicated that there was no significant relationship between anaerobic power and flexibility in male and female judokas. However, there was a moderately negative relationship between 20-meter sprint speed and anaerobic power in both genders. These results suggest that in male judokas, anaerobic power is somewhat linked to flexibility, but this connection is not observed in female judokas. Additionally, it was found that anaerobic power affects 20-meter sprint speed in both genders, with athletes possessing higher anaerobic power being able to run faster. The findings of this study highlight the significant role of gender in motor performance in judo and emphasize the need for designing training programs specific to gender. Further research could enhance the accuracy and generalizability of these findings. Consequently, the development of gender-specific training and performance assessment strategies in judo could contribute to fully realizing the potential of athletes.

Introduction

Today, Judo is generally accepted as one of the most popular martial arts in the world. One way to win a match among judokas is to throw the opponent onto the tatami. At the same time, it is assumed that in order to perform a qualified throw, a judoka must disrupt the opponent's stable balance position. When the opponent loses balance, the athlete should take care to maintain the upright vertical position of their own body (Bressel et al., 2007; Witkowski et al., 2014). Additionally, the ability to maintain the grip on the opponent's kimono and control the body's balance is of great importance for effective technical and tactical movements and motor performance in judo (Socha et al., 2016).

Judo is considered a high-intensity interval combat sport where various physical attributes need to be developed to achieve optimal technical-tactical performance and, consequently, competitive success (Franchini et al., 2011). Moreover, judo success depends on technical-tactical skills, physical conditioning, and psychological factors (Miarka et al., 2012; Ziv and Lidor, 2013; Franchini et al., 2018). According to Bompa (2000), the recommended age to start judo training to reach a high performance standard is between 8 and 10 years, with the age of specialization being 15-16 years. These recommendations encompass the periods of learning, training, and preparation for competition as determined by the long-term athlete development model (Balyi et al., 2003). There is limited research involving judo-specific training adaptations during these physiological and technical development stages.

The child's developmental period is typically referred to as early school age, generally between 7 and 12 years. A

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distinguishing feature of this period is the relatively slow growth in height compared to other growth and development periods (Duraskovic, 2002). Since the increase in height and weight is slow, the development and refinement of motor skills are positively affected (Prodanovic et al., 2013). In this context, the aim of this study was to examine the relationships between critical motor performance criteria such as anaerobic power, flexibility, and 20-meter speed, conducted on 18 judokas aged 8-12 years (11 boys, 7 girls), according to gender.

Methods

Participants

The study was conducted with 18 athletes aged between 8-12 years who were training under the Batman Provincial Directorate of Youth and Sports. The training sessions were held three times a week, each lasting 60 minutes, focusing on technical and physical development in judo. Only athletes without any injuries were included in the study, and informed consent forms were obtained from the parents of the participants prior to their inclusion in the study.

Measurement Tools

Flexibility Test (Sit-and-Reach Test): The flexibility level of the participants was measured using the sit-and-reach test (Tamer, 2000). The sit-and-reach test was performed with the participant sitting on the floor, legs extended, and the soles of the feet in contact with the base of a standard sit-and-reach box (Flex-Tester; Novel Products, Inc., Rockton, IL, USA). The participant was asked to place their hands one over the other and reach forward as far as possible in an active stretch. When the participant could no longer reach forward, this position was held for at least 2 seconds. The distance on the scale of the sit-and-reach box (cm) was measured and recorded.

Vertical Jump Test: The vertical jump test was used to measure the explosive power of the lower extremities of the subjects. The vertical jump distance of the subjects was measured with a digital Jump Meter. Before the test, subjects were allowed to practice to reach maximum height. Subjects were instructed to jump to the highest distance with both feet and land back on the mat with both feet. The test was repeated 2 times, with a 1-minute rest interval between tests, and the best score was recorded in cm (Harman, 1991).

Anaerobic Power Calculation: The anaerobic power of the participants was calculated based on their vertical jump distance. This calculation was performed using a predefined formula.

Determination of anaerobic power (Harman et al., 1991)
Peak Power (W) = 61.9 x jump distance (cm) + 36 x body weight (kg) + 1822

20 Meter Sprint Test: Two photocells (microgate witty) with 0.01 sec precision were placed at the start and end of the 20m course. Subjects started the sprint run from a high start 50 cm behind the starting line, and the best time in seconds was recorded after two trials (Balcıoglu & Biçer, 2022).

Ethical Approval

The Batman University of Ethical Committee (2024/104/06) approved the study and it was carried out in accordance with the Code of Ethics of the World Medical Association also known as a declaration of Helsinki.

Data Analysis

The research analyses were conducted using the SPSS 23 software package. The demographic characteristics of the participants, such as age, height, body weight, and body mass index, were described with mean and standard deviation values. The Shapiro-Wilk test was used to evaluate whether the data were normally distributed. Pearson correlation test was conducted to examine the relationship between motor performance data. The significance level was set at 0.05.

Results

Table 1 reflects the demographic characteristics of the athletes participating in the study. The average age of the participants was found to be 11.00 years for boys and 10.57 years for girls. It is observed that the age difference between gender groups is relatively low. In terms of body weight, the average body weight of male athletes is 41.41 kg, while the average body weight of female athletes is 39.01 kg. The standard deviation of body weight in males (15.57 kg) is slightly higher compared to females, but overall, no significant difference is observed between the two genders. Regarding height, the average height of male athletes is 143.82 cm, while the average height of female

athletes is 142.14 cm. The difference in standard deviations of height is not noteworthy. When examining BMI (Body Mass Index) values, the average BMI of male athletes is 19.25, while the average BMI of female athletes is 18.85. Although there are similarities in BMI values for both genders, the differences in standard deviations are noteworthy.

Table 1
Descriptive information of the participants.

Variables	Male (n: 11)		Female (n: 7)	
	Mean	SD	Mean	SD
Age (years)	11.00	1.26	10.57	1.39
Body Weight (kg)	41.41	15.57	39.01	12.55
Height (cm)	143.82	13.86	142.14	9.56
BMI (kg/m²)	19.25	4.32	18.85	3.68

BMI: Body mass index.

According to Table 2, the average flexibility value for male athletes is 29.18 cm (SD = 4.24), while the average flexibility value for female athletes is 38.29 cm (SD = 7.13). This indicates that female athletes are more flexible than male athletes. In vertical jump performance, the average value for male athletes is 26.45 cm (SD = 5.50), whereas the average value for female athletes is 22.90 cm (SD = 2.99). This finding shows that male athletes are more successful in vertical jump compared to female athletes. In terms of anaerobic power, the average value for male athletes is 4950.59 W (SD = 728.19), while the average value for female athletes is 4644.02 W (SD = 523.68). This suggests that male athletes have an advantage over female athletes in terms of anaerobic power. Finally, looking at the 20m sprint values, the average value for male athletes is 4.26 seconds (SD = 0.30), while the average value for female athletes is 4.49 seconds (SD = 0.47).

Table 3 examines the relationship between the motor performances of judo athletes by gender, and the obtained data were statistically analyzed. According to the findings, although the relationship between anaerobic power and flexibility in male judokas is positive (r = 0.48), this relationship is not statistically significant (p = 0.12). In female judokas, a negative relationship was found between anaerobic power and flexibility, but this relationship is also not significant (r = -0.20, p = 0.65). Regarding the relationship between the 20-meter sprint and anaerobic power, a negative and significant relationship was found in male judokas (r = -0.67, p = 0.02). Similarly, this relationship is negative and significant in female judokas as well (r = -0.60, p = 0.04). Finally, when comparing the relationship between the 20-meter sprint and anaerobic power across genders, a similar negative and significant relationship is observed in both genders.

Table 2
Motor performance of athletes participating in the study.

Variables	Male				Female			
	Mean	SD	Min.	Max.	Mean	SD	Min.	Max.
Flexibility (cm)	29.18	4.24	23	38	38.29	7.135	30	46
Vertical Jump (cm)	26.46	5.50	18.2	39.0	22.90	2.99	18.9	25.9
Anaerobic Power (W)	4950.59	728.19	4035.78	6324.10	4644.02	523.68	3880.10	5489.02
20m Sprint (s)	4.26	0.30	3.61	4.66	4.50	0.47	4.14	5.55

Table 3
Relationship between motor performances of athletes participating in the study.

Variables		Male		Female	
		Flexibility	Anaerobic Power	Flexibility	Anaerobic Power
Anaerobic Power (W)	r	0.48		-0.20	
	p	0.12		0.65	
20m Sprint	r	-0.67*	-0.60*	0.41	-0.77*
	p	0.02	0.04	0.35	0,04

*. Correlation is significant at the 0.05

Discussion

This study aimed to explore the relationships between selected motor performance measures in children aged 8-12 who practice judo. By understanding these relationships, particularly in areas such as flexibility, balance, coordination, and speed, we can develop more effective and tailored training programs that support children's physical development and enhance their sports performance.

Our findings indicate that gender significantly influences motor performance in young judokas. For male judokas, a weak and non-significant relationship was observed between anaerobic power and flexibility, but a significant relationship was noted between 20-meter sprint performance and anaerobic power. This suggests that anaerobic power plays a crucial role in the sprint performance of male judokas. Conversely, in female judokas, no significant relationships were found between anaerobic power, flexibility, and 20-meter sprint performance. These discrepancies may be attributed to gender-specific differences in muscle composition and training regimens, highlighting the need for gender-specific training programs.

Data from various studies suggest that different aspects of judo training can affect motor performance in diverse ways. For instance, Ağaoğlu et al. (2001) reported an average anaerobic power value of 130.09 ±23.3 for the Turkish male judo national team athletes. Similarly, Torres-Luque et al. (2016) found that Spanish male judokas had a higher average vertical jump distance compared to female judokas. Furthermore, Çakıroğlu et al. (2013) demonstrated significant improvements in the experimental group's motor performance compared to the control group. Additionally, Karakoc's (2016) research indicated that visually and hearing-impaired judokas exhibited different vertical jump distances, underscoring how judo training can yield varied motor performance outcomes across different populations.

Chronological age is another critical factor influencing motor performance, as it enhances the integration of the central nervous system and the musculoskeletal system (Haywood & Getchell, 2001). Studies have shown that age can significantly affect muscle strength, particularly in young individuals (Langendorfer & Roberton, 2002). Research by Butterfield et al. (2002) and Burns et al. (2015) has further demonstrated the impact of age on children's motor performance, reinforcing the importance of considering age in training programs.

In addition to age and gender, exposure to various sports activities is essential for the healthy development of posture and motor control, especially in early childhood (Fransen et al., 2012; Cote et al., 1999). Among young judokas, motor development rates are more balanced compared to non-athletes, with potential peaks at ages 11-12 and 14-15 (Jagiello & Kalina, 2007). These insights suggest that participation in a range of sports can prevent the early onset of sport-specific postures and physical characteristics, fostering a more holistic physical development.

Overall, our research underscores the importance of tailoring training programs to the specific needs of young judokas, taking into account factors such as age, gender, and the benefits of diverse physical activities. These findings are valuable for coaches and athletes in optimizing training approaches, and further research is encouraged to continue refining these strategies. By doing so, we can support the development of young athletes, enhancing their performance and promoting their overall physical health.

Authors' Contribution

Study Design: SA, MY, DT, SÖ, MŞ; Data Collection: MŞ, DT, SÖ; Statistical Analysis: SA; Manuscript Preparation: SA, MŞ, DT, MY, SÖ; Funds Collection: SA, MŞ.

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Conflicts of Interest

The authors declare that there are no conflicts of interest related to this article.

Ethical Statement

The Ethics Committee of Batman University, in its meeting held on May 30, 2024, approved the ethical evaluation related to the study with decision number 2024104-06.

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