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Original article

EFFECT OF ANAEROBİC POWER ON QUİCKNESS IN WOMEN NATİONAL TAEKWONDO ATHLETES

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Abstract*

Aim. In this study, the aim was to examine in the effect of anaerobic power on quickness in women taekwondo athletes. Thirty elite taekwondo players from the Turkey national team, (age=21.29±2.73 years; height=1.67±0.059 m; weight=59.64±8.509 kg; sport age=10.29±3.315 years) for fourteen women participated as volunteer in this research.

Methods. The procedure was Wingate test for anaerobic power and 5 meter sprint test for quickness performance.

Results. Significant relationships were found between quickness performance with anaerobic peak power and anaerobic mean power respectively (r= -0.547) and (r= -0.536) for women athletes. Also, regression analysis revealed that anaerobic peak power and anaerobic mean power was a significant predictor of quickness performance, explaining respectively 30% and 29% of the variance for women athletes. Anaerobic peak power and anaerobic mean power in a unit change affects quickness performance in -0.001 rate (P <0.05) for women athletes.

Conclusion. In conclusion, the increase in anaerobic power has been increased the quickness performance for women athletes. It is considered that quickness performance was affected by anaerobic power for women athletes.

*Key words***:** Anaerobic power, Quickness, Sport, Taekwondo.

Introduction

The anaerobic system is necessary for technique manifestation through fast movements with energy supplied by the creatine phosphate and glycolytic system (Horswill, 1992, Yoon, 2002). The anaerobic power is an important criterion for performance in sports such as taekwondo where short-term explosive efforts are made. Also, anaerobic power is described as a capability to utilize an individual's phosphagen system in a high volume and short-term muscle activities and show an individual's maximal efficiency in the first seconds (Reiser, 2002). Anaerobic power is regarded as limitations of processes which in ATP molecule are mostly regenerated by energy from a substance which is called creatine phosphate and can be destroyed at a great speed. Even though they are limited in muscles, their power is considerably high and they have ability to create necessary energy in a short period. In highly intensive and short term efforts, these energy resources are used. Quickness can be fully expressed in a movement only if the athlete has a significant energy supply. Quickness is a muscular characteristic of activating joints against external resistance units, in spite of body resistance or a part of body resistance as earliest as possible. In a sense, it can be defined as series of repeating movements excessively and immediate speed changes in physics at consecutive and non-consecutive various speeds in multiple fields (Moreno, 1994). Quickness is a capability to interpret one situation and give reaction to that one. Quickness is of multiple skills which consist of explosiveness, reactivity and acceleration (Murphy, 2003). The first point is shown as quickness (0-5m), acceleration (0-10m) and maximum speed (0-30m) (Cronin, 2005). Athletes need quickness more in order to react from a static position to a sudden movement (Yap, 2000). Quick power is a capability to defeat external resistance factors when neuron-muscle system contracts at a high speed. Neuron-muscle system accepts reactions and shows performance with a quick burden when elastic and contractile elements of muscles become active with reflexive system. Therefore, quick power is called elastic power and explosive power. Quick power is a determinant characteristic of efficiency in the fields of sprint, shot, throw which requires a high quickness of contractions and a capability to break resistances in muscular system (Dündar, 2012). Taekwondo has several essential elements including high levels of dynamic and isometric strength, anaerobic and aerobic conditioning, quickness, flexibility, and power.

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Therefore, the aim of study was to examine in the effect of anaerobic power on quickness in women taekwondo athletes.

Methods

Subjects

Fourteen women national taekwondo athletes in Turkey (age 21.29±2.73 years, height 1.67±0.059 m, weight 59.64±8.509 kg, and years of taekwondo experience 10.29±3.32 years) volunteered to participate in the study. Before testing began, the aim and procedures of the study were explained to the participants and informed consent was obtained. The study was approved by the Ethics Committee in Selçuk University. The study was performed before European championship. Anaerobic power tests and quickness test in University laboratory were conducted. Anaerobic power performance as measured by Wingate test was used to represent anaerobic peak power, anaerobic peak power/kg, anaerobic mean power, and anaerobic mean power/kg. Assessments of quickness performance included 5 meters quickness test.

Procedures

Height and weight were measured with subjects in training clothes (shorts and t-shirt) and barefoot. Height was measured to the nearest 0.1 cm. Weight was measured to the nearest 0.1 kg using a scale. In first test day, quickness performance measurement was conducted. In second test day, Wingate test was applied.

Anaerobic power test (Wingate test)

The Wingate power test is used in the measurement of anaerobic peak power, anaerobic peak power/kg, anaerobic mean power and anaerobic mean power/kg (work in 30 s). The women national taekwondo athletes warmed up for 5 minutes at a pedaling rate of 60–70 rpm against a resistance equal to 20% of that calculated for the subsequent Wingate anaerobic test. Two unloaded 5-second sprints were performed at the end of the third and fifth minutes of the warm-up period. The maximal pedaling rate (RPM_{max}) attained during the sprints was recorded. The women national taekwondo athletes were instructed to pedal as fast as possible from the onset of the test. The resistance was applied when 75% of the previously recorded RPM_{max} was attained, as determined by the computer. The women national taekwondo athletes were verbally encouraged to maintain as high a pedaling rate as possible throughout the 30-second test duration. Pedal revolutions were monitored at a resolution of 0.025 revolutions and recorded at 1-second intervals. Women national taekwondo athletes' PP (determined as the highest value over a 5-second period of testing) and MP (determined as the average power throughout the 30 seconds of testing), were calculated for each test (Hoffman, 2000).

Quickness test

The ability to rapidly accelerate from a standing position was measured over a 5-m dash initiated from a standing position. The athletes wait for the signal at the starting point. On the signal, they run at maximum speed. When they reach the finish point, the time between the starting and finish lines is measured with photocell in terms of seconds (Professional Sport Technologies, Sport Expert). This test allows the assessment of quickness performance.

Statistical Analysis

All analyses were performed using SPSS 16.0 for Windows (SPSS Inc., Chicago, IL). Values were expressed as mean and standard deviation (SD). One Sample Kolmogorov-Smirnov test was used to examine whether the variables were normally distributed. In case of normality, the associations between quickness performance and anaerobic power tests were analyzed using Pearson product-moment correlation analysis. Also, effect of the independent variable (Anaerobic power) on dependent variable (Quickness performance) was analyzed as linear regression analysis. The level of significance chosen was $p<0.05$.

Results

Table 1. Physical characteristic data for the women national taekwondo athletes (N=14).

Variables	Mean ± S.D
Age (years)	21.29 ± 2.730
Height (m)	1.67 ± 0.059
Body weight (kg)	59.64 ± 8.509
Experience (years)	10.29 ± 3.315

The data summary of the physical characteristics is shown in Table 1. The mean ages were 21.29±2.73 years, mean height were 1.67±0.059 m, mean body weight were 59.64±8.509 kg, and mean experience were 10.29±3.32 years for women national taekwondo athletes.

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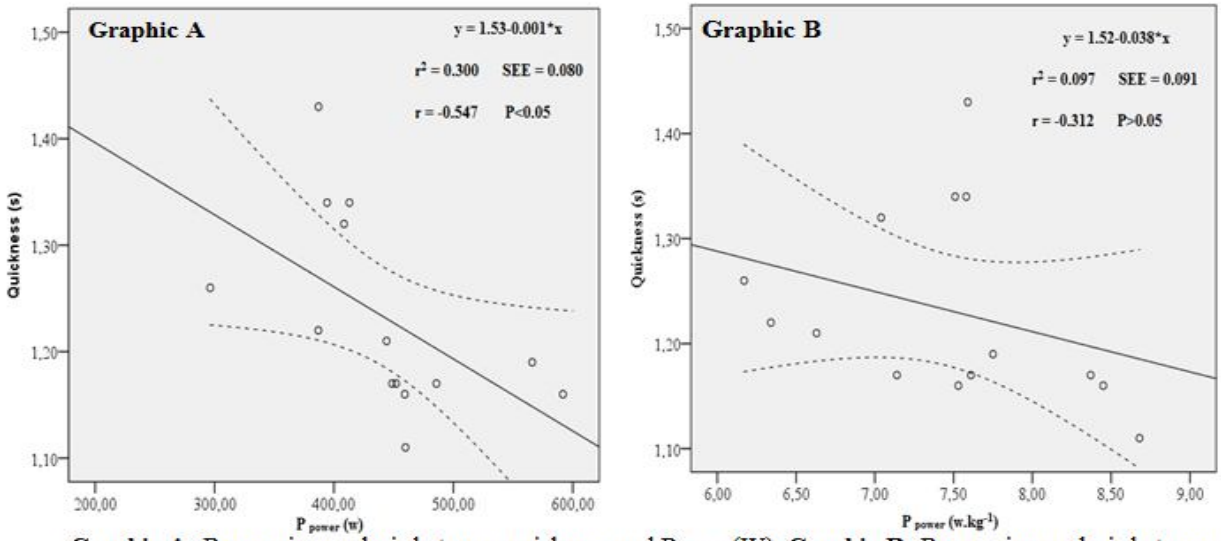
Table 2. Quickness and anaerobic power scores for the women national taekwondo athletes (N=14).

Variables	Mean ± S.D
quickness (s)	1.23 ± 0.09
Anaerobic peak power (watt)	442.405 ± 74.445
Anaerobic peak power/kg (watt/kg)	7.456 ± 0.751
Anaerobic mean power (watt)	337.194 ± 48.179
Anaerobic mean power/kg (watt/kg)	5.703 ± 0.500

As shown table 2, quickness performance mean were 1.23±0.09 s, anaerobic peak power mean were 442.405±74.445 watt, anaerobic peak power / kg mean 7.456±0.751 waat/kg, peak mean power mean were 337.194±48.179 watt, and anaerobic mean power / kg mean 5.705±0.500 watt/kg for women national taekwondo athletes.



Graphic A: Regression analysis between quickness and P_{power} (W); **Graphic B:** Regression analysis between quickness and P_{power} ($W.kg^{-1}$).

As Shown Graphic A, regression model is significant ($p<0.05$). There is a significantly relationship between quickness and anaerobic peak power (w) in women taekwondo national athletes (r= -0.547; F=5.133; P=0.043).

Also, regression analysis revealed that anaerobic peak power was a significant predictor of quickness performance, explaining respectively 30% of the variance for women national athletes.

Anaerobic peak power in a unit change affects quickness performance in -0.001 rate ($P <0.05$) for women athletes. On the other hand, **in Graphic B,** regression model is insignificant ($p>0.05$) for quickness and anaerobic peak power ($w.kg^{-1}$).

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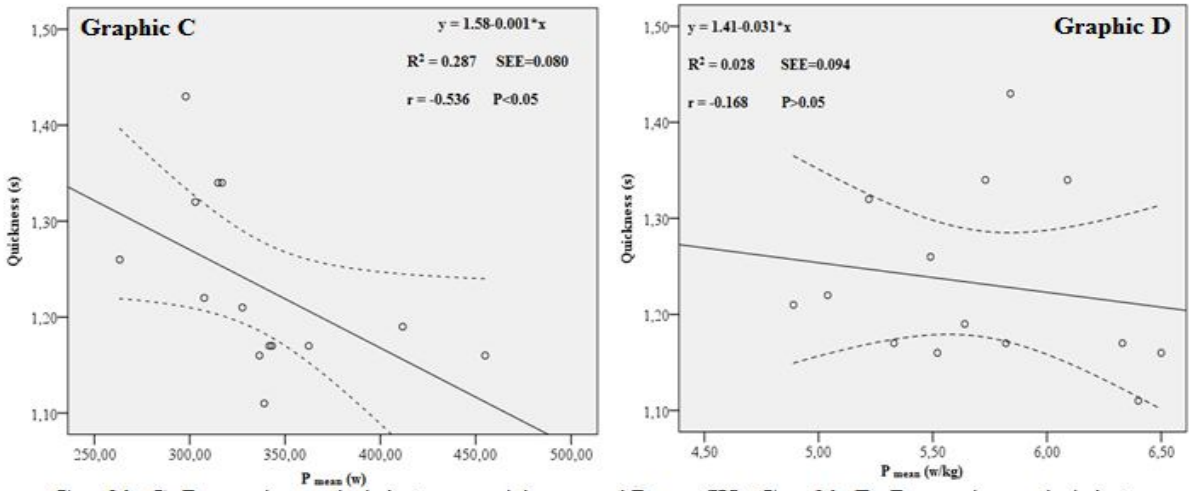

Graphic C: Regression analysis between quickness and P $_{mean}$ (W); **Graphic D:** Regression analysis between quickness and P $_{mean}$ (W.kg^{-1}).

As Shown Graphic C, regression model is significant (p<0.05). Significant relationships were found between quickness performance and anaerobic mean power (r= -0.536; F=4.834; P=0.048) for women taekwondo national athletes. Also, regression analysis revealed that anaerobic mean power was a significant predictor of quickness performance, explaining 29% of the variance for women taekwondo national athletes. Anaerobic mean power in a unit change affects quickness performance in -0.001 rate (P <0.05) for women taekwondo national athletes. On the other hand, **in Graphic D,** regression model is insignificant (p>0.05) for quickness and anaerobic mean power (w.kg^{-1}).

Discussion

Strength, power, quickness, and running speed are thought to be important for successful participation in all sport branches. Taekwondo require quickness and explosive power as well as more complex and exquisite neuromuscular coordination to quickly move. There have been no previous studies that have profiled quickness performance and anaerobic power in elite women taekwondo athletes. This study indicated relationship between anaerobic power and quickness performance on women taekwondo national athletes. It was found that is between quickness performance with anaerobic peak power (r= -0.547) and anaerobic mean power (r= -0.536).

Also, anaerobic peak power and anaerobic mean power was a significant predictor of quickness performance, explaining respectively 30% and 29% of the variance for women national athletes. A unit increases that either anaerobic peak power or anaerobic mean power reflect change of rate -0.001. We did not find a correlation between quickness performance with anaerobic peak power/kg and anaerobic peak mean power/kg. This would imply that quickness tests do not reflect the anaerobic peak power/kg and anaerobic peak mean/kg. In a study made by the Chaouachi et al. (1), it did not find associate between vertical jumping (61.9±6.2 cm) and quickness performance (0.82±0.05 s) (r= –0.39; P=0.12).

The same study reported sprint times for distance of 5 m (0.82 second), 10 m (1.7 second), and 30 m (4.1 seconds) for elite basketball players. Studies carried out in different sports show that the latent period for a simple movement reaction is an expression of quickness (Verkhoshansky, 1996). In literature, quickness, in all its specific facets, is influenced mainly by two factors: 1) the organization and functional regulation of the neuromotor apparatus and 2) the active and operative implementation of the motor structure of the movement (Verkhoshansky, 1996).

Conclusions

Although there are many studies that associated with quickness in physical education and sport field. We did not find any studies which are between relationship anaerobic power and quickness performance. In conclusion, the increase in anaerobic power has been increased the quickness performance for women athletes. It is considered that quickness performance was affected by anaerobic power for women athletes.

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