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The Relationship Between Eurofit Test Battery Parameters and Freestyle Swimming Times of 7-11 Years Old Swimmers

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ORIGINAL RESEARCH

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Abstract

The correlation between certain swimming characteristics such as power, strength, balance, flexibility and swimming speed can play an important role in the selection process. Tests such as the Eurofit test battery can provide insight into predictive values in the evaluation of these parameters. However, few studies have focussed on the correlation between swimming speed and data obtained from the Eurofit test battery. Therefore, the aim of this study was to determine the relationship between the Eurofit test battery and freestyle swimming times of swimmers aged 7-11 years. Thirty male athletes participated in the study. The tests were administered in accordance with the instructions of the Eurofit Test Battery. According to the normality distribution status of all athletes, correlation test was applied for the relationship strength between all parameters and the correlation coefficient was examined. Pearson correlation test was applied for parameters with normal distribution. In the findings, a significant positive correlation was found between free still swimming time and balance, arm movement time (sec), while a significant negative correlation was found between flexibility, long jump, hand grip and 30 s sit-ups (pcs). As a result, it can be concluded that balance and arm movement speed are positively correlated with free still swimming time of elementary school swimmers, while 30 s shuttle (sec), hand grip strength, long jump and flexibility are negatively correlated.

Anahtar kelimeler: Children, Eurofit Test Battery, Free Still Swimming.

7-11 Yaş Grubu Yüzücülerin Eurofıt Test Bataryası Parametreleri İle Serbest Yüzme Süreleri Arasındaki İlişki

Öz

Yüzmede güç, kuvvet, denge, esneklik ve yüzme hızı gibi belirli özellikler arasındaki korelasyon seçim sürecinde önemli bir rol oynayabilir. Eurofit test bataryası gibi testler bu parametrelerin değerlendirilmesinde tahmin değerlerine ilişkin fikir verebilir. Ancak çok az çalışma, Eurofit test bataryasından elde edilen verilerin yüzme hızı arasındaki korelasyona odaklanmıştır. Bu yüzden bu çalışmanın amacı, 7-11 yaş aralığındaki yüzücülerin eurofit test bataryası ile serbest stil yüzme süreleri arasındaki ilişkiyi belirlemektir. Çalışmaya 30 erkek sporcu katılmıştır. Testler Eurofit Test Bataryası'nın belirlediği talimatlar doğrultusunda yönergelerine uygun bir şekilde uygulanmıştır. Tüm sporcuların normallik dağılım durumlarına göre tüm parametreler arasındaki ilişki gücü için korelasyon testi uygulanmıştır ve korelasyon katsayısına bakılmıştır. Normal dağılım gösteren parametreler için Pearson korelasyon test uygulanmıştır. Bulgularda serbest still yüzme süresi ile denge, kol hareket süresi (sn) arasında pozitif yönde anlamlı korelasyon bulunurken esneklik, uzun atlama, el kavrama ve 30 s mekik (adet) parametleri arasında negatif yönde anlamlı korelasyon bulunmuştur. Sonuç olarak, ilkokula giden yüzücülerin serbest still yüzme dereceleri ile denge ve kol hareket süratinin pozitif ilişkili, 30 s mekik (adet), el kavrama kuvveti, uzun atlama ve esnekliğin ise negatif ilişkili olduğu söylenebilir.

Keywords: Çocuk, Eurofit Test Bataryası, Serbest Yüzme.

Introduction

Swimming is a sport that aims to progress by moving on the water surface with certain movements of the upper and lower extremities without the use of aids and is a very important sport for all age groups (Nikolić et al., 2018). Swimming aims to complete certain distances in the shortest time in accordance with predetermined rules in freestyle, backstroke, breaststroke and butterfly styles and combining all of them with individual mixed technique. This sport is an activity that requires a complex set of motor skills including movement and rhythm perception (Bíró et al., 2015). Swimming is a sport that contributes to the development of many psychomotor skills such as endurance, strength, power and coordination and physiological changes in athletes in the pre-adolescent period, starting from an early age (Çevik et al., 2019). In addition to physiological changes, changes also occur in biological development and psychological and social development. In the case of children, developmental periods can be decisive in the exercise to be performed. For example, the sensitive period of coordination capacities is between the ages of 7 and 12 (Farfel, 1960). Swimming proficiency is the result of the interplay among morphological, physiological, psychological, and technical elements, all of which are influenced by an individual's genetic predisposition and are subject to ongoing refinement through the training regimen. (Gabbet et al., 2007). In particular, the correlation between certain characteristics such as power, strength and swimming speed can play an important role in the selection of children for this sport. Some tests can provide insight into predictive values in the assessment of strength and power (Zampagni et al., 2008). Usually, measurement tools for performance assessment such as swimming speed, strength, power, etc. are expensive and not available to coaches or experts in the field of swimming. This issue can become particularly challenging when dealing with young swimmers. Certain scholars argue that evaluating the strength and power of young swimmers does not necessarily require costly, intricate, or time-intensive equipment. (Silva et al., 2007; Toskić, 2018).

The Eurofit test battery is a user-friendly, dependable, and extensively employed collection of assessments for evaluating motor skills. The outcomes of these assessments can be benchmarked against global data from participants of the same age. Significantly, this test battery is readily applicable and doesn't necessitate costly equipment, which is of particular significance for professionals working with children (Gajević, 2009; Oja and Tuxworth, 1995; Tsigilis et al., 2002). Eurofit test batteries have been used for more than two decades to assess children's physical skills in Europe and the world (Drljačić et al., 2012). Nonetheless, limited research has concentrated on the association between strength levels assessed through the Eurofit battery test and swimming velocity. Consequently, this study aimed to investigate the association between Eurofit test battery results and the freestyle swimming performance of swimmers in the age range of 7 to 11 years.

Material and Method

Araştırmanın Modeli

This study is a cross-sectional quantitative research.

Population and Sampling / Study Group

The sample group was selected from students attending primary school and swimming branches in Florya, Yeşilköy and Yeşilyurt districts of Istanbul. Thirty male athletes with a mean age of 9.30±1.18 years participated in the study.

Data Collection Tools

All of the tests in this study were administered in accordance with the instructions of the Eurofit Test Battery. The participants' height was recorded in meters using a SECA brand device and their weight was recorded in kg using a SECA brand digital scale. Body mass index (BMI) was calculated using the formula of body weight divided by the square of height (kg/m^2). In the 25 m freestyle swimming test, a 100-memory stopwatch (Selek brand) was used.

25 m Freestyle Still Swimming Time Test

Participants performed warm-up exercises on land before the measurements and then were prepared with 200 m freestyle swimming in the water. Participants exited the water for the 25 m sprint test with the ready command. The stopwatch was started at the moment of exit. During the 25 m freestyle swim, the stopwatch was stopped when the athlete's head was out of the water and intersected the poles standing opposite each other at the 25th meter of the pool.

Eurofit Test Battery Test

The Eurofit physical fitness test battery consists of 9 tests assessing flexibility, speed, endurance and strength. These are flamingo balance test, arm movement speed test, sit reach test, standing long jump test, hand grip strength test, 30s shuttle test, bent arm hang test, 10 x 5 meter shuttle run test and 20 m endurance (shuttle) run test. The tests were performed in approximately 35-40 minutes. All measurements were completed within 1 week in an indoor gym.

Flamingo Balance Test

In this test, a 50 cm long, 4 cm high and 3 cm wide wooden beam was used. Participants tried to stand barefoot on the beam in a long axis similar to the flamingo stance. While standing on the balance leg, the other leg was bent to contact the knee. On command, the stopwatch was started and participants tried to maintain balance. Time was stopped when balance was lost and time was recorded until the next loss of balance. Balance disturbances occurring within 1 minute were counted. If more than 15 balance losses occurred within the first 30 seconds, the test was terminated and a score of zero was given.

Arm Movement Speed Test

Two plastic disks with a diameter of 20 cm were placed on a table. The participant tried to touch the 2 disks alternately and quickly using their preferred hand. The center points of the disks were placed 80 cm apart. The participants' best result was scored. The score was calculated by recording the time it took to touch each disk a total of 25 times, in tenths of a second.

Sit and Reach Test

Participants were asked to sit on a 35 cm long, 45 cm wide and 32 cm high box in front of them and, after resting their bare feet on the inner surface of the box, to move the bar on the plate as far as they could with both hands. The value at the last point reached by the participants was measured and recorded.

Standing Double Leg Forward Jump

Participants stood with their feet shoulder width apart, with their toes just behind the line. With arms in front, knees bent and body parallel to the ground, participants jumped forward as far as they could with the swing of the arms. The test was repeated twice and the best grade was recorded.

Hand Grip Strength Test

They gripped the dynamometer with their right hand at an angle of about 30 degrees between the arm and the trunk and squeezed it strongly. The test was repeated 2 times and the best result was recorded.

30s Sit-Up Test

Participants lay on a mat on their backs. Their knees were bent at 90 degrees while holding their necks with their hands. On command, they lifted their shoulders off the mat and straightened towards their knees. For 30 seconds, the number of sit-ups was recorded.

Bent Arm Hang Test

The participant was positioned in front of a horizontal bar at a height he/she could reach without jumping, with shoulders broad, thumb on the bottom and other fingers on the top under the bar. With assistance, the chin was raised above the bar and the participant tried to maintain this position for as long as possible without the chin going under the bar. The test ended when the eyes went under the bar. The holding time was recorded.

Measurement of running speed 10x5 Shuttle Run

A cone placed 5 meters apart was prepared. The participant ran as fast as possible from behind the starting line, past the cone and back to the starting line. He repeated 10 times until he reached a total of 50 meters and the running time was recorded.

Measuring Endurance Shuttle Run

Participants ran for a distance of 20 m until exhaustion. The running speed was checked at regular intervals by means of a tape recorder. The last shuttle reached at the end of the test was recorded.

Analysis of Data

The tests and analyses used in the study were performed on IBM SPSS Statistics 29.0.1.0 version programme and the findings were generated. Descriptive statistics were used for all parameters. In descriptive statistics, arithmetic mean values, minimum values, maximum values and standard deviation values were given. In order to examine the relationship between the parameters of Eurofit test batteries and 25 m freestyle swimming times, normality test was applied on the parameters of each section. Pearson correlation test type was applied for the parameters showing normal distribution as a result of normality test.

Ethical Considerations

Participants and their parents were informed about the aim and objective of the study and their written informed consent was obtained. The entire study procedure was carried out with the approval of the Declaration of Helsinki and Scientific Research Ethics Committee (2023-20796).

Results

The n number (number of observations), minimum (lowest value), maximum (highest value), arithmetic mean and standard deviation values of all athletes are shown in Table 1.

Table 1

Demographic Characteristics of All Participants

Parameters	n	Min.	Max.	AA	SD
Age(years)	30	7	11	9,30	1,18
Height(cm)	30	123	169	139,60	10,10
Body Weight(kg)	30	20	60	32,03	9,75
BMI	30	11,83	25,3	16,21	3,17

BMI=Body Mass Index, Min=Minimum, Max=maximum, AA=Arithmatic Average, SD=Standard Deviation

Table 2

Descriptive Statistics for Eurofit Test Battery Parameters

Parameters	n	Min.	Max.	AA	SD
Flamingo	30	4	10	7,10	1,61
Arm Movement Speed(sec))	30	9,9	12	10,94	0,56
Sit and Reach(cm)	30	19,5	22,24	20,71	0,76
Long Jump(cm)	30	129	172	143,73	10,56
Hand Grip Force(kg)	30	10,1	18,3	13,47	1,81
30 seconds Sit-ups (pcs)	30	19	28	23,03	2,22
Twisted Arm Hanging(sec)	30	18	30	22,50	3,14
10x5 Shuttle Run(sec)	30	20	29	22,60	2,63
20 Meter Shuttle	30	11	18	14,03	1,85

Min=Minimum, Max=maximum, AA=Arithmatic Average, SD=Standard Deviation

The n number (number of observations), minimum (lowest value), maximum (highest value), arithmetic mean and standard deviation values of all athletes regarding the eurofit test battery are shown in Table 2.

Table 3

Results of all participants regarding the relationship between Eurofit test battery and free still swimming

		Flamingo	Arm movement Time (sec)	Sit and Reach (cm)	Long Jump (cm)	Hand Grip Force (kg)	30s Shuttle (pcs)	Free Still Swimming 25m (sec)
Flamingo	Pearson Correlation	1	,572’’	-,757’’	-.666’’	-,302	-,717’’	,614’’
	Sig.(2-tailed)		**<,001**	**<,001**	**<,001**	,105	**<,001**	**<,001**
	n		30	30	30	30	30	30
Arm movement Time (sec)	Pearson Correlation		1	-,488’’	-,194	-,250	-,688’’	,505’’
	Sig.(2-tailed)			**,006**	,303	,182	**<,001**	**,004**
	n			30	30	30	30	30
Sit and Reach (cm)	Pearson Correlation			1	,643’’	,376’	,731’’	-,521’’
	Sig.(2-tailed)				**<,001**	,041	**<,001**	**,003**
	n				30	30	30	30
Long Jump (cm)	Pearson Correlation				1	,457’	,503’’	-,621
	Sig.(2-tailed)					**,011**	**,005**	**<,001**
	n					30	30	30
Hand Grip Force (kg)	Pearson Correlation					1	,336	-,548’’
	Sig.(2-tailed)						,069	**,002**
	n						30	30

30s Shuttle (pcs)	Pearson Correlation						1	-,600’’
	Sig.(2-tailed)							**<,001**
	n							30

**p=0.01, *: p=0.05

As shown in Table 3, there was a positive correlation between the flamingo balance test and arm movement speed (r=0.572, p<0.001) and 25 m free still swimming time (r=0.614, p<0.001), while there was a negative correlation between sit-to-stand flexibility (r=-0.757, p<0.001), long jump (r=-0.666, p<0.001) and 30 s sit-ups (pcs) (r=-0.717, p<0.001). There was a negative correlation between arm movement and sit-ups (r=-0,488, p<0.001) and 30 s sit-ups (pcs) (r=-0,688, p<0.001) and a positive correlation between arm movement and 25 m freestyle swimming time (r=0,505, p=0.004). There was a positive correlation between sit-to-stand and long jump (r=0.643, p<0.001) and 30 s sit-ups (pcs) (r=0.731, p<0.001), while there was a negative correlation between 25 m free still swimming time (r=-0.521, p=0.003). There was a positive correlation between long jump and hand grip strength (r=0.457, p=0.011) and 30 s sit-ups (pcs) (r=0.503, p=0.005), while there was a negative correlation between 25 m free still swimming time (r=-0.548, p=0.002).

Discussion

In this study, the relationship between the eurofit test battery and freestyle swimming times of elementary school swimmers was investigated.

As the main finding of the study, a positive correlation was found between the flamingo balance test and arm movement speed and 25 m freestyle swimming time, while a negative correlation was found between sit-to-stand flexibility, long jump and 30 s sit-up. There was a negative correlation between arm movement and sit-to-stand and 30 s sit-up, and a positive correlation between 25 m free still swimming time. There was a positive correlation between sit-to-stand and long jump and 30 s sit-ups, while there was a negative correlation between 25 m free still swimming time. A positive correlation was found between long jump and handgrip strength and 30 s sit-ups, while a negative correlation was found between 25 m free still swimming time.

Swimming provides an opportunity for children to develop their abilities, especially gross motor skills. Motor development is the control of physical movements through the actions of coordinated nerve and muscle centers. In addition, swimming takes place in a state of almost zero gravity with buoyancy of the water. This special combination allows all biomotor characteristics to be maximized during swimming. In this dynamic process, certain joints maintain stability while others contribute to power generation with wide mobility. This concerted effort is designed to allow the body to move through the water at maximum speed. In other words, during swimming, some joints focus on maintaining stability while others use their wide range of motion to propel the body through the water at top speed (Tanaka and Seals, 1997; Susilowati, 2020). In the results of this study, a positive correlation was found between balance and free still swimming time and arm movement speed. This indicates that a child with good balance can swim faster or a child who swims faster has better balance. Therefore, these results support the above information. Similar to this study, Ping et al. (2011) also found a significant positive correlation between dynamic balance and swimming performance in a study conducted in flipper swimming athletes. Baccouch et al. (2023) also stated that swimming improves balance.

During swimming speed, the whole body must move in a kind of kinetic chain integrity. The links of this chain are the upper limbs, central muscles (core) and lower limbs. For the effective generation of propulsion, the most important work is performed by the upper limbs and the trunk. The other rings together provide the stabilization of these muscles and the regulation of the workload. Girold et al. (2012) found a highly significant relationship between upper body strength and sprint swimming speed. In our study, the significant positive correlation found between arm movement speed and balance is similar to this study.

The motor abilities of swimmers are divided into factors that are directly or indirectly present in the realization of basic kinesiological activity. In studies, it has been stated that there is a significant correlation between flexibility and the success of international level swimmers in swimming (Colman et al., 1992; Rama et al., 2006). It has been reported that flexibility of the shoulder, pelvic and ankle joints and knee joint may be important in swimming technique. However, in the findings of this study, contrary to this belief, a significant negative correlation was found between free still swimming time and flexibility. Therefore, we can say that an athlete with good flexibility has longer swimming times or an athlete with longer swimming times has lower flexibility. Similarly, Tošić (2011) found that flexibility did not have a statistically significant effect on swimming times with regression analysis. These differences in the studies may be due to factors such as athlete age, decreased tonus in horizontal position, time spent in warm water, continuous friction created by water during movement, and prolonged swimming.

Conclusion

In this study, it can be said that balance and arm movement speed of swimmers aged 7-11 years were positively related in free still swimming, while 30 s sit-ups, handgrip strength, long jump and flexibility were negatively related.

Ethics Committee Permission Information

Ethics review board: Health Sciences University Hamidiye Scientific Research Ethics Committee

Date of the ethical assessment document: 11.08.2023

Number of the ethical assessment document: 23/493

Declaration of Contribution Rates of Researchers

The subject and planning of the research were carried out by the first author, the processes related to the method and findings were carried out by the first and second author, the processes related to the statistics were carried out by the second author, and the processes related to the discussion and conclusion were carried out by the first author.

Conflict Statement

The authors have no conflict declaration regarding the research.

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