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Dry land training and swimming performance in children aged 11-12 years

Antrenamentul specific pe uscat şi performanţa la înot la copii de 11-12 ani

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Abstract

Background. Muscle strength is one of the most important motor qualities, which largely influences the speed of execution of movements and activities that require strength and skill. When carrying out this study, we had in mind that most elite swimmers use swim benches in dry-land training and for performance diagnosis.

Aims. We aimed to emphasize the importance of dry-land strength and power training for swimming performance in children.

Methods. A number of 20 female swimmers, aged 11 to 12 years, members of the Swim to Perfection Sports Club Cluj-Napoca, took part in the study, for a period of 4 weeks. They attended a special training program 3 times a week (Monday-Wednesday-Friday), a number of 5 repetitions of 35 seconds each (butterfly style). The training sessions were conducted using the biometer isokinetic trainer. Two testings for 50 m (butterfly style), on day 1 and day 28 were performed.

Results. Our data show that four weeks of specific training, using the biometer isokinetic trainer, improve the athletic performance of young swimmers.

Conclusions. Dry-land strength training using the swim bench may enhance the ability to produce propulsive force in water, especially in short distance races.

Key words: exercise, strength, power, biometer isokinetic trainer – swim bench.

Rezumat

Premize. Forţa musculară este una din cele mai importante calităţi motrice, care influenţează în mare măsură atât viteza de execuţie a mişcărilor, cât şi activităţile care necesită rezistenţă şi îndemânare.

Obiective. Ne-am propus să evidenţiem importanţa antrenamentului de forţă şi putere pe uscat în performanţa la înot, la copii.

Metode. La studiu au participat un număr de 20 sportive, cu vârsta de 11-12 ani; lot martor, (m=10), lot sportive (s=10), înotătoare, componente a Clubului Sportiv "Swim to Perfection" Cluj-Napoca, vârsta 11-12 ani, timp de 4 săptămâni. Acestea au efectuat un antrenament specific de 3 ori pe săptămână (luni-miercuri-vineri), un număr de 5 repetări a 35 de secunde fiecare (procedeu fluture). Antrenamentul s-a efectuat pe simulatorul biometer isokinetic trainer, banca de înot. S-au efectuat două testări pe distanţa de 50 m, ziua 1 şi ziua 28.

Rezultate. Rezultatele cercetării arată că patru săptămâni de antrenament specific pe uscat, folosind simulatorul - banca de înot, duc la îmbunătăţirea performanţelor sportive a tinere înotătoare.

Concluzii. Antrenamentul de forţă pe uscat cu banca de înot poate stimula abilitatea de a produce forţa propulsivă în apă, cu preponderenţă în probele de scurtă durată.

Cuvinte cheie: efort fizic, forţă, putere, bancă de înot (simulator).

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Introduction

Muscle strength is one of the most important motor qualities, which largely influences both the speed of execution of movements and the activities that require strength and skill.

Muscle strength can be defined as the possibility of a muscle or muscle groups to voluntarily produce force or a couple against external resistance, under specific conditions defined by muscle action, speed of movement and posture (Siff, 2000; Stone et al., 2007; Zatsiorsky, 1995, Miller, 2012, cited by Suciu & Popovici 2013). Maximum muscle strength is the possibility to voluntarily produce maximal force or an external resistance couple under specific conditions defined by muscle action, speed of movement and posture (Gavin, 2012).

Muscle strength is a fundamental property of human performance that provides important information on human performance by evaluating the effects of training. This can be defined as the "ability to overcome internal and external resistance by muscle contraction" (Tudor, 2002), the strength parameters being recently proposed as one of the multifactorial phenomena that improve swimming performance (Barbosa et al., 2010).

The tests used for determining muscle strength are a way of monitoring the response to the training program (Stone et al., 2007, cited by Gavin, 2012); in order to measure the necessary load in strength training (Baechle et al., 2008; Bompa & Haff, 2009) and to monitor recovery after injuries (Flanagan et al., 2008, Meller et al., 2007).

Dry-land training using the swim bench is used by the majority of elite swimmers for diagnosing performance, generally measuring mechanical strength. Athletes train on the swim bench for 1 hour and 45 minutes, compared to 3 hours, the duration of training in the water (Shoulberg, 2012).

Dry-land training allows to create an efficient swimmer, without injuries, who is capable of adapting to any stress and competition conditions; the aim is to better train the human body out of the water to be effective in the water environment (Gambeta, 2012).

Objectives

We aim to evidence the importance of dry-land strength and power training for swimming performance in children.

Hypothesis

We assume that dry-land training with the biometer isokinetic trainer will improve strength and will also have a great impact on performance, increasing it.

Material and methods

Research protocol

We mention that according to the Helsinki Declaration, the Amsterdam Protocol and Directive 86/609/EEC, the approval of the Ethics Board of the "Babeş-Bolyai" University of Cluj-Napoca for carrying out the research on human subjects, as well as the informed consent of the parents and subjects participating in the research were obtained. The swimmers attended the usual training program with the swimming team throughout the duration of the research. No swimmer withdrew from the study.

a) *Period and place of the research*

The research was carried out at the Universitas Swimming Complex of the "Babeş-Bolyai" University, over a period of 4 weeks, in May 2013.

b) *Subjects and groups*

The study included 20 female swimmers (n=10 swimmers/group), having practised swimming for 5 years, members of the Swim to Perfection Sports Club Cluj-Napoca, aged 11-12 years. The control group (C) performed usual training in the water, and the group of swimmers (S) performed in addition to usual training in the water, specific training 3 times a week (Monday-Wednesday-Friday), a number of 5 repetitions of 35 seconds each (butterfly style). Training was conducted on the biometer isokinetic trainer (produced by the Fahnemann company, Germany).

c) *Tests applied*

Two testings for 50 m (butterfly style), on day 1 and day 28 of training were performed after a low intensity 1000 m warm up session. Time (T1 and T2) and speed (V1 and V1) were measured.

d) *Statistical processing*

Statistical processing used the Excel application (Microsoft Office 2007) and the StatsDirect v.2.7.2 software. The results were graphically represented using the Excel application (Microsoft Office 2007). The data were uniformly distributed, so the Student test for paired samples was applied.

Results

Table I shows the comparative analysis of time values in the studied groups, moments T1 and T2, and statistical significance. The statistical analysis of time values between moments T1-T2 evidenced highly statistically significant differences in group S ($p<0.001$) and statistically significant differences in group C ($p<0.05$). The statistical analysis of time values between the groups showed statistically significant differences at moment T1 ($p<0.05$) and very statistically significant differences at moment T2 ($p<0.01$).

Table I

Comparative analysis of time values for the 50 m distance (sec) at the studied moments and statistical significance.

Group	Moment	Mean	SE	Median	SD	Min.	Max.	Statistical significance (p) between moments (T1-T2)
S	T1	35.475	0.9683	34.58	3.0622	31.8	41.15	0.00096
	T2	34.844	0.9557	34.22	3.0223	31.15	40	
C	T1	39.184	0.9209	38.925	2.9120	34.5	44.33	0.0177
	T2	39.074	0.9180	38.78	2.9030	34.41	44.3	
Statistical significance (p) between groups (S-C)			T1	0.01247		T2		0.005

Table II

Comparative analysis of speed values (m/sec) at the studied moments and statistical significance.

Group	Moment	Mean	SE	Median	SD	Min.	Max.	Statistical significance (p) between speeds (V1-V2)
S	V1	1.42	0.0381	1.45	0.1204	1.22	1.59	0.001229
	V2	1.44	0.0384	1.46	0.1214	1.25	1.61	
C	V1	1.28	0.0301	1.28	0.0951	1.13	1.45	0.027
	V2	1.29	0.0309	1.29	0.0976	1.13	1.47	
Statistical significance (p) between groups (S-C)			V1		0.01107	V2		0.005

Table III

Statistical analysis of correlation between the values of the studied indicators.

Group	Indicator	IMC		T1		T2		V1	
S	T1	0.1303463	*						
	T2	0.1019385	*	0.9907869	****				
	V1	-0.1139987	*	-0.9948539	****	-0.9891799	****		
	V2	-0.106651	*	-0.9856435	****	-0.9972947	****	0.9908042	****
C	T1	-0.4279911	**						
	T2	-0.4092353	**	0.9991517	****				
	V1	0.4531697	**	-0.9968396	****	-0.9955243	****		
	V2	0.4325717	**	-0.9937095	****	-0.9940664	****	0.9986301	****

Table II presents the comparative analysis of speed values in the studied groups and statistical significance. The statistical analysis of speed values evidenced very statistically significant differences in group S ($p<0.001$) and statistically significant differences between the same moments in group C ($p<0.05$). The statistical analysis of speed values between the groups showed statistically significant differences for speed V1 ($p<0.05$) and very statistically significant differences for speed V2 ($p<0.01$).

Table III presents the statistical analysis of correlation between the studied indicators.

The statistical analysis of correlation between the values of the studied indicators showed the following:

- for the group of swimmers:
  - a very good positive correlation between T1-T2 and V1-V2;
  - a very good negative correlation between V1-T1, V2-T1, V1-T2, V2-T2.
- for the control group:
  - a very good positive correlation between T1-T2 and V1-V2;
  - a very good negative correlation between V1-T1, V2-T1, V1-T2, V2-T2.

Discussion

Potts et al. (2002) evidenced the importance of using the swim bench in training for the correction of the technique and found at the same time a strength imbalance between the two arms, which would have important implications in the optimization of performance.

Studies performed on female swimmers, with creatine supplementation, have shown that the supplementation had no beneficial effects on performance and did not improve speed; in contrast, swim bench training had beneficial effects on performance (Dawson et al., 2002).

Swim bench training results in an obvious increase in strength, under the conditions in which the number of imposed cycles also increases, which allows the athlete to ”mobilize” more strength in an event (Ignat, 2006).

Swim benches are useful for diagnosing individual performance if mechanical strength is acquired (Heller et al., 2004).

During simulated swimming, the legs can support more power compared to arms. Also, the intra-subject variation in measuring strength is low using dry-land ergometers. These assessment methods might be useful for explaining swimming performance and for monitoring the changes that occur during training (Swaine, 2000).

Our results emphasize the importance of using the swim bench in dry-land training. Dry-land strength training using swim benches can stimulate the ability to produce propulsive force in water, predominantly in short distance events.

The comparative analysis of the groups shows an improvement of time as well as speed between the two testings, which leads to an increase of sports performance in the 50 m butterfly event, the results being more significant in the group of swimmers compared to the control group.

Three swimmers of the group participating in the research won the National Champion title in various events, which recommends the use of the swim bench in dry-land training.

Conclusions

1. Dry-land training on the biometer isokinetic trainer for four weeks has beneficial effects, with the improvement of time and speed in the 50 m butterfly event.

2. Dry-land training using the swim bench improves sports performance compared to training in the water.

Conflicts of interests

Nothing to declare.

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