STRENGTH PARAMETERS OF COLLEGE STUDENTS IN ISOKINETIC MODE IN FRONT CRAWL SWIMMING

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ABSTRACT

In this paper we evaluate the level of strength abilities in isokinetic mode male and female students of Faculty of Physical Education and Sport, Comenius University in Bratislava, specialization conditioning coach in front crawl swimming. Force parameters were investigated on a solid curtain of water at the specified speed swimming. The aim of the research was to determine the level of force parameters in front crawl swimming and set the optimal speed swimming at the trial for the college students. At swimming isokinetic dynamometer, we tested 13 students, swim at speeds of 0.3 ms^{-1} to 0.6 ms^{-1}. Filed of female students (n 10) were evaluated in swimming speed of 0.2 ms^{-1} to 0.5 ms^{-1}. The results were registered in the computer software Fitronic Swim. We evaluated parameters of force and power. Motor test lasted 10 s. We registered changes of maximum and average force at specific swimming speed. In a group of students, we noted a gradual decline in maximum force of 141 N at a speed of swimming 0.3 ms^{-1} to 96.7 N in swimming speed 0.6 ms^{-1}. The average force in the set had a similar trend with lower power (Fig.1) output parameter (the product of force and velocity) and the maximum average power was increasing the marginal rate of 0.4 ms^{-1} and at higher swimming speeds decreased (Fig.1). Based on the results we determine the optimal speed for the students to swim objective evaluation of force parameters 0.4 ms^{-1}, and for female students 0.3 ms^{-1}.

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Key words: university students, free style swimming, force, power, isokinetic mode

INTRODUCTION

Compared to different sports, support for movement execution in swimming is variable. Swimming performance is highly determined by special strength abilities (Maglischo, 2003, Hopper and comp., 1980). These abilities are dependent on capability to transform strength into effective propulsion (propelling strength), in relation with water environment. Main propulsive phase is the most important factor of swimming stroke. It is dependent on the level of strength abilities and mostly on effectiveness of a swimming technique of a particular swimmer. Demand for accurate assessment of strength parameters is closely connected with demand for its effective development. During assessing the strength abilities in swimming, it is important to optimize the values of swimming speed, i.e. isokinetic mode. Evaluation of force parameters in water during different swimming speeds enables us to objectivize the monitoring of force levels within a particular technical development of an individual.

Scientific work brought knowledge of different levels of strength abilities in individual swimming styles (Putala, 2009, Janič, 2009) and of differentiated force level in isokinetic mode in different performance groups (Macejková a kol., 2012, Grznár, 2011). Complete knowledge from stated papers tells us, that a higher swimming speed is better for evaluating force in water with swimmers rather than with non-sporting population.

In this report, we evaluate the level of strength abilities in isokinetic mode of students of program – coaching with specialization in fitness coaching of free style swimming at FTVŠ UK. Strength parameters were gathered on fixed suspension in water, during predetermined swimming speeds.

The aim of this research is to find out optimal swimming speed for evaluating the strength abilities within the free style swimming of FTVŠ UK students.

METHODS

Group of n 13 male students took part in this research, aged 21±3 years and a group of n 10 female students aged 21± 2 years. Each tested individual was subject to testing on swimming isokinetic dynamometer. The device consists of magnetic breaking system, a mechanism for releasing the cable and weight sensor. The sensor can measure resistance between 0 N and 1 000 N (Newton). Magnetic breaking system is controlling the speed of releasing the cable from 0.1 $m.s^{-1}$to 2.0 $m.s^{-1}$. Tested students were hooked to swimming isokinetic dynamometer by a thin cable attached to a belt.

Each subject from the group swam four motoric tests, using free style technique and different swimming speeds. Male students from 0.3 $m.s^{-1}$to 0.6 $m.s^{-1}$. Female students from 0.2 $m.s^{-1}$ to 0.5 $m.s^{-1}$. Each motoric test took 12 s, while for the results we considered primarily 10 s data. The results were recorded to a computer by FITRONIC SWIMM (Fig. 1) software. With each tested individual, we have registered minimum, maximum and average strength (N) and performance (combination of strength and speed)(W).

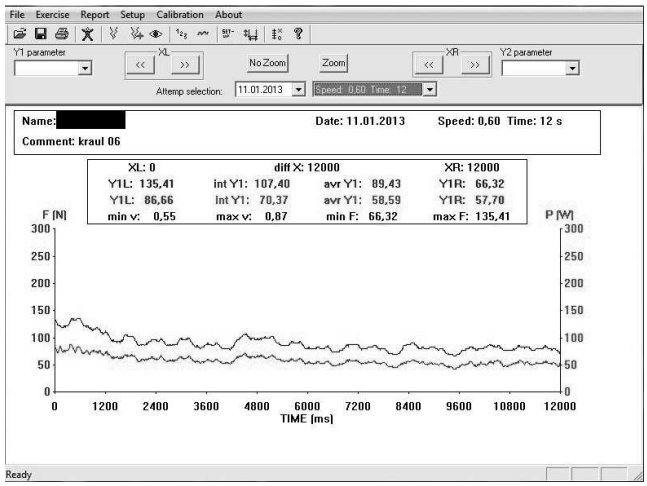

Figure 1
Software FITRONIC – SWIMM

RESULTS AND DISCUSSION

Average force of male students while swimming at 0.3 m.s^{-1} was 80 N. Average force of female students was at the same speed 39 N. The difference in measured values of strength of both groups was 62 N (Fig. 2). While evaluating the average power, we have found out that male students reached power of 29 W and female students of 14 W. The difference being 15 W.

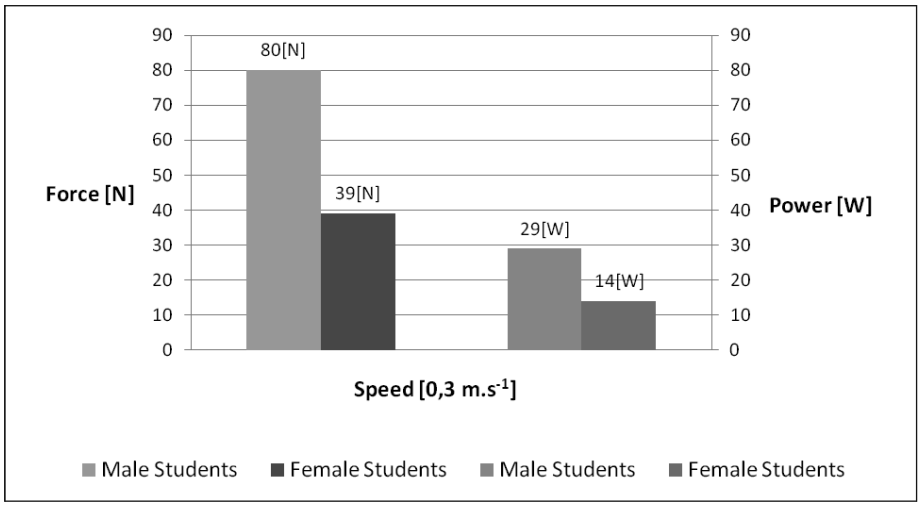

Figure 2
Comparison of average force and power of male and female students at 0.3 m.s^{-1} swimming speed

The group of male students had higher values of maximum and average force than female students (Fig. 3). The difference in maximumforce was 62 N (149-79) and in average force 42 N (80-39). From our results and results of other authors (Grzná, 2011)we can understand, that male students of FTVŠ UK achieve higher values of force and powerthan female FTVŠ UK students. The results are mostly affected by the level of strength rather than swimming technique.

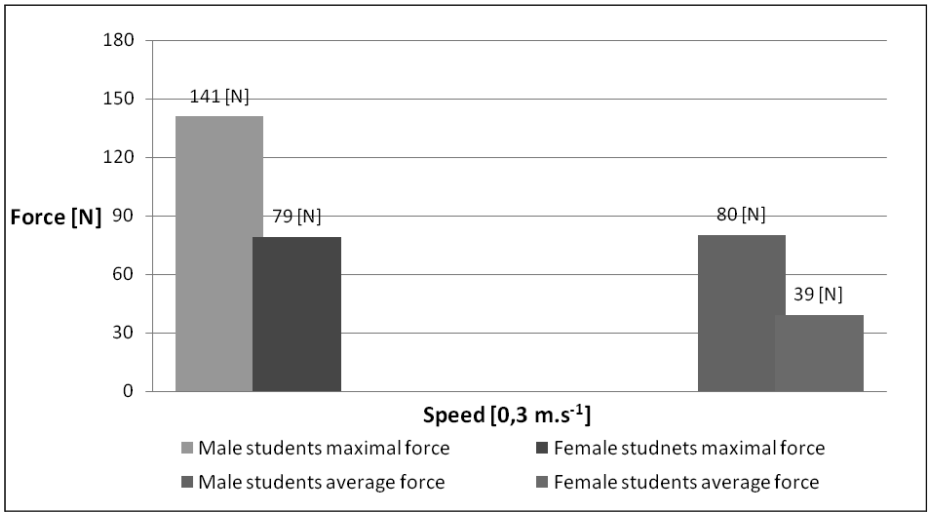

Figure 3
Comparison of maximum and average force of male and female students at 0.3 m.s^{-1} swimming speed

The average power and average forceof male and female FTVŠ UK student is presented on Fig. 4. We have recorded higher force during slower swimming speed in both groups. The force values got lower with higher speed, but highest values of power (combination of force and speed) were measured with male students at 0.4 m.s^{-1} and female students at 0.3 m.s^{-1}.

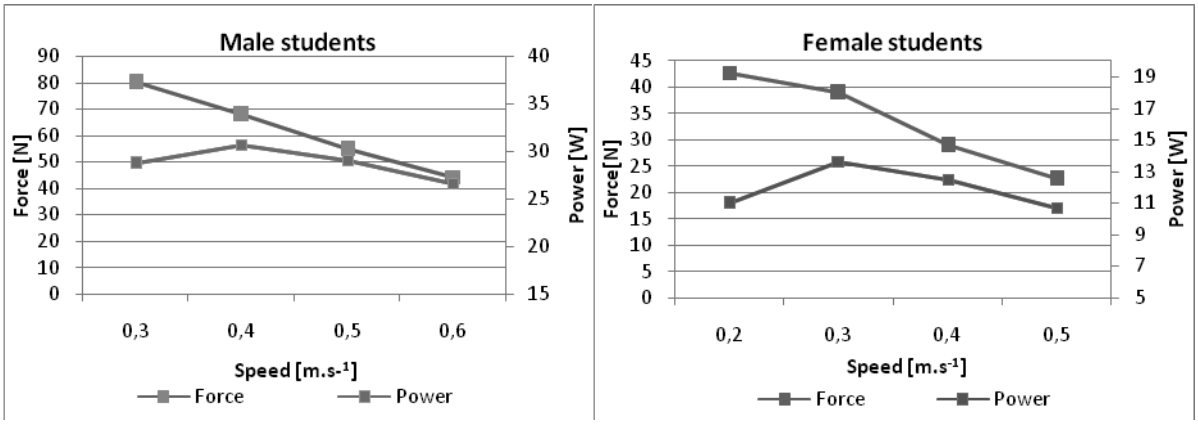

Figure 4
Average force and power during different swimming speeds of male and female students

The efficiency of swimming technique of both groups was lower compared to performance swimmers. The results of authors (Janič, 2009, Maglischo, 2003, Matúš, 2009, Záhorec a kol.2010) on evaluating the force of performance swimmers recommend the swimming speed of 0.8 $m.s^{-1}$. Great differences during measuring water strength in isokinetic mode within different performance groups are caused by different effectiveness of swimming technique and level of special strength abilities.

CONCLUSION

The research brought particular results depicting strength abilities in isokinetic mode within free style swimming of male and female students of FTVŠ UK. Higher force parameter values in isokinetic mode of male students group result from higher level of strength dispositions.

We believe that from watched force parameters, the optimal indicator of strength abilities in swimming is average force. It mirrors maximum and minimum levels achieved during the time of motoric testing of an individual swimmer.

The optimal swimming speed for strength diagnosis of male students is 0.4 m.s-1 and female students is 0.3 m.s-1.

REFERENCES

Grznár, Ľ. 2011. *Zmeny úrovne silových parametrov pri rozdielnych rýchlostiach plávania voľným spôsobom študentov FTVŠ UK :* Bakalárska práca. Bratislava: Univerzita Komenského. 2011. 34 s.

Hopper, R.T. a kol. 1980. *Specificyofstrengthtesting in swimming.* Abstrakt. Medicine and Science in SportExercise, 1980, 12(2), s. 135.

Janič, P. 2009. *Úroveň silových parametrov diagnostikovaných v izokinetickom režime v plaveckých spôsoboch vrcholových plavcov*: diplomová práca. Bratislava: Univerzita Komenského, 2009. 64 s.

Macejková Y., Putala M., Grznár Ľ. 2012 *Porovnanie optimálnej rýchlosti plávania rozdielnych výkonnostných skupín na hodnotenie silových parametrov vo voľnom spôsobe* In. Vedecké práce 2012[CD-ROM]. Bratislava : STU, 2012 s. 119-124

Maglischo, E. W. 2003. *Swimmingfastes*. Champain Illinois: HumanKinetic. 2003.790 s. ISBN 0-73603180-4

Matúš, I. 2009. *Analýza úrovne maximálnej sily a výkonu vo vode a na suchu výkonnostných plavcov* : Diplomová práca. Bratislava: Univerzita Komenského, 2009. 75s.

Putala, M. 2009. *Úroveň izokinetickej sily výkonnostných plavcov v plaveckej špecializácii prsia* : Diplomová práca. Bratislava : FTVŠ UK, 2009. 56 s.

Záhorec, J. a kol. 2010. Metodologické prístupy diagnostiky silových schopností v izokinetickom režime výkonnostných plavcov. In MACEJKOVÁ Y. a kol. *Diagnostika silových schopností v izokinetickom režime v plávaní.* Bratislava: Peter Mačura – PEEM. 2010, s 6-13. ISBN 878-80-8113-015-1