

significant difference was found in the swimming velocity relative to the given lactate concentration from 2 up to 14 mmol/L between the subsamples (Wilks' Lambda=0.170, p=0.857). The cut-off point in the swimming performance of the two subsamples was established at the intensity of 1.799 m/s (55.59 sec), or at the lactate concentration of 14.56 mmol/L in favor of the top subsample swimmers. Also, the results of the study showed that the defined lactate curve mathematical models had the following forms: top subsample,  $y=43.7176x^3 - 156.0224x^2 + 191.2574x - 79.0989$ ,  $R^2 = 0.9997$ ; elite subsample,  $y=122.0672x^3 - 500.7031x^2 + 690.1629x - 317.2770$ ,  $R^2=1.00$ , where  $y$ =lactate concentration;  $x$ =swimming velocity. Used test protocol showed statistical specific sensitivity, and established data's could be useful in the process of control of elite crawl stroke swimming preparedness and for elite swim training technology development.

#### Poster-18

##### Effects of flotation devices on children's aquatic locomotion

*Flávio Antônio De SOUZA CASTRO (Universidade Federal do Rio Grande do Sul, Brazil), Rossane T. WIZER*

Considering (i) the regular use of arm float devices (AFD) in swimming lessons for children and (ii) the lack of studies regarding swimming pedagogy, the aim of this study was to verify the effects of AFD in the results of Erbaugh Scale's Locomotion Tasks applied to children who took lessons with and without AFD. Sixteen 30-min-lessons, twice a week, were taught to 16 children randomly divided into two groups: lessons with AFD (WAFD,  $n = 8$ , age =  $38.8 \pm 3.6$  months) and without AFD (NAFD,  $n = 8$ , age =  $41.7 \pm 3.7$  months). The Erbaugh Scale's locomotion tasks performed were front, back, and kicking. Comparisons were made intra- and inter-group, pre- and post-intervention. Tests were done without AFD in both groups and moments. Wilcoxon and Mann-Whitney tests were administered,  $\alpha \leq 0.05$ . After the 16 lessons, WAFD improved performance in the front ( $Z = -2.53$ ;  $p = 0.01$ ) and kicking tasks ( $Z = -2.37$ ;  $p = 0.01$ ), but not in the back task ( $Z = -1.26$ ;  $p = 0.08$ ). NAFD improved performance in the three locomotion tasks: front ( $Z = -2.67$ ;  $p < 0.001$ ), kicking ( $Z = -2.55$ ;  $p < 0.001$ ) and back ( $Z = -2.68$ ;  $p = 0.007$ ). When the groups were compared in the pre-intervention, they presented similar results in the back task ( $U = 25.0$ ;  $p = 0.25$ ), but the WAFD group started better than the NAFD in the front ( $U = 14.0$ ;  $p = 0.02$ ) and kicking ( $U = 15.0$ ;  $p = 0.03$ ) tasks. Regarding post-intervention results, the groups presented similar results in the three tasks: front ( $U = 25.5$ ;  $p = 0.27$ ), back ( $U = 31.0$ ;  $p = 0.62$ ) and kicking ( $U = 25.5$ ;  $p = 0.13$ ). AFD promote a decrease of upper body density in relation to the lower limbs. The difference between the force application points unbalances the body, increases the drag and makes the horizontal locomotion in the aquatic environment difficult. These results can assist teachers on their methodological choices in swimming lessons.

#### Poster-19

##### Acute effect of virtual reality on swimming performance: a pilot study

*Guilherme TUCHER (Instituto Federal do Sudeste de Minas Gerais, Brazil), Gustavo Ferreira QUINTÃO, Renan RIBEIRO, Alex Fernandes Da Veiga MACHADO*

Studies in virtual reality (VR) have shown changes in perception that modifies the motor behavior. We believe that an acute VR with improved true stroke rate (SR) can change velocity ( $v$ ), SR and stroke length (SL) while swimming, whereas a VR with same SR, can't do it. This study aims to test the acute effect of VR in  $v$ , SL and SR of recreational swimmers. Nine recreational swimmers with  $30,4 \pm 12,3$  age were separated in two groups which are: Experimental Group (EG;  $n = 5$ ) and Control Group (CG;  $n = 4$ ). Each group performed a maximum 20-m crawl in three different days to obtain the previous true average values of  $v$ , SL and SR. On another day, before a new 20-m crawl, the swimmers were stimulated with VR, seeing and hearing a virtual swimmer with arm stroke rate equivalent for each swimmer. However, while the EG had a stimulus 10% higher of true SR in VR, the CG was stimulates with the same true values. The VR performed three times with 1-min interval. Up until 30-sec after the last VR, the swimmer performed the 20-m swim test – obtaining the final true values. Anova with repeated measures was used and it was considered  $p < 0.05$ . In first trials, EG showed  $v$  of  $1.51 \pm 0.2$  m\*s<sup>-1</sup>, SR of  $50.4 \pm 8.0$  cycle\*min<sup>-1</sup> and SL of  $1.5 \pm 0.2$  m\*cycle<sup>-1</sup>; CG showed  $v$  of  $1.48 \pm 0.1$  m\*s<sup>-1</sup>, SR of  $51.0 \pm 5.7$  cycle\*min<sup>-1</sup> and SL of  $1.7 \pm 0.1$  m\*cycle<sup>-1</sup>. In final trial, EG showed  $v$  of  $1,53 \pm 0,2$  m\*s<sup>-1</sup>, SR of  $53,9 \pm 8,8$  cycle\*min<sup>-1</sup> and SL of  $1,5 \pm 0,2$  m\*cycle<sup>-1</sup>; CG showed  $v$  of  $1,52 \pm 0,1$  m\*s<sup>-1</sup>, SR of  $56,5 \pm 2,85$  cycle\*min<sup>-1</sup> and SL of  $1,5 \pm 0,1$  m\*cycle<sup>-1</sup>. This comparison did not show significant changes in  $v$  ( $p > 0.05$ ). The SR increased significantly ( $p = 0.001$ ), however, without differences between groups. The SL decreased significantly in CG ( $p = 0.01$ ). The results did not support our hypothesis and we believe that placebo effect influenced swimmers performance.

#### Poster-20

##### A comparison of the evidence produced in sports science and swimming between 2013 and 2017

*Barbosa TIAGO (Nanyang Technological University & Reserch Centre in Sports, Singapore), Mario J. Costa TIAGO M. BARBOSA*

The aim was to compare the amount of papers published in "Sport sciences" and Swimming "science" between 2013 and 2017. A

search was conducted on the 7th of November 2017 on the Web of Science®. The search aimed to retrieve original and review articles in English under the “Sport sciences” category, between the 1st of January 2013 and the 7th of November 2017. Another search was conducted to retrieve only the “swimming” papers under the “Sport sciences” category. 11,338 out of 13,171 “Sport sciences” papers were retained for further analysis. 777 out of 898 papers in “Swimming” were retained as well. Papers not retained are in other languages, abstracts, editorials, letters or proceeding papers. From the retained papers it was extracted: (i) the type of access (open or close); (ii) country or territory of the authors; (iii) number of publications in each year; (iv) H-index in each year and; (v) average citations per item (ACI) in each year. “Swimming” represented 6% of the total number of publications in the “Sport sciences” category. The percentage of open-close access publications was 15-85% in “Swimming” and 11-89% in “Sport sciences”. Based on the number of publications, USA was the country with the highest number of papers published (127 papers; 16.3% of the total amount), followed-up by Brazil (111; 14.3%) and Australia (107; 13.8%). “Sport sciences” was led by USA (3,779; 33.3%), Australia (1,767; 15.6%) and England (1,727; 15.2%). Both territorial rankings in “Sport sciences” and “Swimming” featured countries from Africa, Asia, Australia/Oceania, Europe, North America and South America. The yearly number of papers published in “Swimming” ranged between 178 (in 2015) and 136 (in 2017). In “Sport sciences” the number ranged between 2,718 (in 2016) and 1,965 (in 2013). The H-index in “Swimming” decreased from 18 (ACI: 8.43) in 2013 to 3 (ACI: 0.32) in 2017. In “Sport sciences”, the H-index ranged between 52 (ACI: 12.61) in 2013 and 5 (ACI: 0.38) in 2017. As a conclusion, “Swimming” is a niche topic in “Sport sciences”, representing only 6% of the total number of papers published.

#### Poster-21

##### **Background to the birth of the “Flying Fish of Fujiyama”: The swimming life of Hironoshin Furuhashi**

*Takuya MEGURO (Nihon University, Japan), Takuma FUJII,  
Dan TOMIUCHI, Risako MITSUI, Tomohiro NOGUCHI,  
Takahisa FURUKAWA*

Hironoshin Furuhashi is a world-renowned swimmer. He established a series of new world records after the Second World War, including his phenomenal 1500m freestyle record of 18:19.0 (18 minutes, 19 seconds) in the 1949 U.S. National Men’s Swimming and Diving Championships. This was an astounding record for the time. Furuhashi became a national symbol of courage and hope for Japan, which was a defeated country after the war. Despite such brilliant success, there is very little information available on Furuhashi’s world-famous career as a swimmer. This study aimed to elucidate that career by focusing on his swimming life, the environment in which he grew up as a

swimmer, and how he became world-renowned. **METHOD:** The study period spans from Furuhashi’s childhood to his experience in the U.S. Men’s Swimming and Diving Championships of August 1949. This was the event that made his swimming abilities known to the world. The author examined literature on Furuhashi as a swimmer, including an autobiography, biographies, and contemporaneous newspaper articles. **RESULT:** The following facts were revealed. Furuhashi received parental love in his childhood, and was raised in a particularly strict manner by his father, Uhachi. This enabled Furuhashi to become mentally and physically strong. Thus, he fostered the basic ability to endure the severe training that resulted in his swimming capability. Additionally, coaches who trained Furuhashi (for example, his elementary school coach, Keizo Nakamura) did not force him to apply conventional swimming training, but provided him with training that placed emphasis on his individual ability. This led to the development of Furuhashi’s own original swimming method, which utilized arm strength. Furuhashi had swimming talent, but also the talent to make an effort; he lost his left middle finger from the tip to the first joint in an accident that occurred during his volunteer labor service during the war in 1943. Furuhashi also had to exercise for swimming despite wartime-shortages and lack of food. He did not give up, however, and kept training despite the difficult environment. Eventually, Furuhashi became a world-renowned swimmer.

#### Poster-22

##### **The influence of age, gender, frequency of teaching and starting competency level on the acquisition of water competencies in relation to drowning prevention among beginners**

*Målfrid JUNGE (University of Oslo, Norway), Robert Keig  
STALLMAN*

**INTRODUCTION:** A variety of factors affect the learning rate of beginning swimming skills. Age generally affects rate of learning and final result. Starting level is at least as important as age. The aims of this study were a) to test the feasibility of a method for creating learning curves, and b) to examine the effects of age, gender, teaching frequency and starting skill level on the learning rate of beginning swimming skills. **METHODS:** One hundred and thirty seven (137) five and six year old children from 13 kindergartens, participated in the study. One hundred sixteen (n=116) met the inclusion criterion of fifty percent or more participation. Eighteen hours of instruction was conducted, either once or twice per week with half of the children in each frequency group and equal numbers of each gender. The teaching progression of 19 skills also served as the assessment tool. Learning curves were constructed by recording the lesson in which each skill was mastered. The 19 skills were plotted on the Y axis and the 18 lessons were plotted on the X axis, thus