

## Cross-sectional study of the level of basic swimming skills of elementary school pupils in a selected region of the Czech Republic in the years 1995–2015

KATEŘINA STRAŠILOVÁ<sup>1</sup>, PETR VAJDA<sup>2</sup> and MARTIN ZVONÁŘ<sup>3</sup>

<sup>1,3</sup> Department of Kinesiology, Faculty of Sport Studies, Masaryk University, CZECH REPUBLIC

<sup>2</sup> Department of Gymnastics and Combatives, Faculty of Sport Studies, Masaryk University, CZECH REPUBLIC

Published online: January 31, 2020

(Accepted for publication: December 20, 2019)

DOI:10.7752/jpes.2020.01036

### Abstract

The physical performance and level of motor skills of children in the Czech Republic have been declining for a long time. Children spend their free time passively, e.g. sitting in front of the TV or playing computer games, and more of them suffer from overweight and obesity. However, the increasing number of swimming pools and swimming schools in Brno indicates the growing popularity of swimming and water sports. The aim of this study was to evaluate the swimming skills of elementary school pupils during the years 1995–2015. We found the swimming skills records for this 20-year period of 14.793 year two pupils who had never participated in a swimming course during their school attendance. The ratio of swimmers and non-swimmers, as well as the influence on the given ratio made by variations in the national curriculum caused by changes to the law on schools were assessed. It was shown that there has been an increase in the proportion of swimmers and a decrease in the proportion of pupils afraid of water. The number of pupils who were able to float and were not afraid of water was about 20 % in all 20 years (range 14.2–26.9 %). We can track a positive trend in swimming skills even though there has been no obligatory swimming course at primary schools in the Czech Republic since 2005. Positive trend in swimming skills shows that even in a period of increasing physical inactivity of children, a positive trend can be traced in some movement skills if the appropriate conditions are provided.

**Keywords:** Children, obligatory swimming course/lessons, physical activity/inactivity, physical education, primary school, swimming level.

### Introduction:

Swimming and water activities are usually understood to be beneficial to the health. Studies reveal a positive influence on development of lung function, the heart, the nervous system and the metabolism (Stanković, Marković, Dopsaj, Ignjatović, & Aleksić, 2016). Swimming could also prevent high blood pressure (Guthrie, Erickson, & Lau, 2013). Buoyancy in water reduces the pressure on the musculoskeletal system. In addition, most of the muscles are involved in swimming. Therefore, from this point of view, swimming and motion in water can be a lifelong physical activity.

It is appropriate to start swimming training at a young age. Swimming courses are also suitable for physical education (Stanković et al., 2016). Apart from the bodily development of the child, this also works as prevention against drowning which is one of the most common accidents in youth. According to the World Health Organization (WHO), drowning and permanent consequences of such accidents in water are included on the list of the most common risks for children, especially among children aged from one to four years (Peden, UNICEF, & World Health Organization, 2008). Swimming skills are important throughout life and can be used until old age due to the nature of physical activity in water. This is also in agreement with a study examining views of pedagogical staff on the suitability of lifelong activities in physical education. They placed swimming at the top of the list (Allen, Mackey, & Rollenhagen, 2016). Swimming can also enhance the self-confidence of individuals in childhood (sajadian & Mehr, 2011). This phenomenon is observable in sports in general. However, in swimming training, children often have to overcome unknown feelings and trust their abilities in their introductory familiarisation with the aquatic environment. This could increase its positive effect on self-confidence. Obesity and physical inactivity are included among the most topical health risk factors. According to the WHO, widespread overweight and obesity increased more than twofold between 1980 and 2014, and 1.9 billion adults and 41 million children under five years of age currently suffer from such conditions. Obesity is a frequent cause of many health problems. Globally, more people die of overweight than of malnutrition. One of the main causes of overweight is physical inactivity (World Health Organization, 2016). Swimming is a suitable exercise activity for overweight people with mobility problems, because there is no shock or great stress on the musculoskeletal system. Physical activities performed in the water have a lower impact on joints overloaded over the long term. A person who is immersed to his/her shoulder level loses almost 90 % of his/her weight in

water. Swimming is therefore advantageous for obese individuals, as it reduces the incidence of secondary orthopaedic injuries (Penaforte, Calhau, Mota, & Chiarello, 2015). The energy expenditure of an obese adolescent during swimming is similar to that during dry-land exercise such as a 65–85 W cycle ergometer, circuit training, group games or team sports (Thiel, Vogt, Claußnitzer, & Banzer, 2011). Increasing swimming skills in the population can therefore be an appropriate means in the fight against overweight and obesity. A study of 4,405 randomly selected residents of Warsaw has shown that older, obese and overweight people choose swimming as their physical activity more often than their counterparts (Biernat, 2012). In physical education, more vigorous physical activity can be achieved during a swimming lesson than during a dry-land lesson (Schwamberger & Wahl-Alexander, 2016), although travel or transport to the pool, changing and hygiene take up a considerable part of the lesson time (Cardon, Verstraete, De Clercq, & De Bourdeaudhuij, 2004).

#### Material and methods:

*Participants and procedures:* We compiled and evaluated entry records of children attending swimming lessons at the swimming pool in Rašínova Street, Brno over a period of 20 years. These records describe the existing swimming experience of elementary school pupils in year two who started their swimming lessons here. These entrance measurements were conducted by teachers at the beginning of each course with new pupils. The procedure was the same for the entire period with the presence of at least one head teacher (who participated in the whole research period) and one assistant teacher (who taught here for just part of the research period). The records were created as part of the swimming lesson quality assessment. We evaluated records from the years 1995–2015. We examined records of 14,793 pupils and 34 elementary schools over this 20-year period. The number of pupils in each school year differed (depending on the size of each class participating in a swimming course). Records included notes on five basic skills: 1) submerging the face and head, 2) floating on the front, 3) floating on the back, 4) swimming 5 metres in shallow water, and 5) swimming more than 5 metres in deep water. The research sample was completely anonymous. Only the total number of pupils in the class and their classification to the individual categories (submerging the head, floating on the front /back ...) were known. The informed consent of the parents of children involved in the research was not required in view of the anonymity of the research.

*Statistical analysis:* The swimming skills of children who had not had swimming lessons at elementary school until that time were evaluated on the basis of the above-mentioned basic skills criteria. The results were divided into three categories: (1) children who were afraid of water, (2) children who were not afraid of water but could not swim, (3) children who were not afraid of water and could swim. We evaluated the ratio of swimmers and non-swimmers over the twenty-year period. We also rated the influence of variations to the national curriculum caused by changes to the law on schools in 2005.

#### Results:

The data was tested by the Kolmogorov–Smirnov test and it was found that the collected data did not fit a normal distribution. The total number of pupils in the rated categories is shown in Table 1. Here we can see the total number of pupils in each evaluated year and their percentage in the individual categories.

*Table 1 – Total numbers of swimming pupils in each school year*

School year	Total numbers of swimmers				Percentage ratio				
	Afraid	Not afraid	Swim	Total	School year	Afraid	Not afraid	Swim	Total
1996/97	453	164	257	874	1996/97	51.8	18.8	29.4	100.0
1997/98	419	213	376	1008	1997/98	41.6	21.1	37.3	100.0
1998/99	466	188	451	1105	1998/99	42.2	17.0	40.8	100.0
1999/00	344	207	467	1018	1999/00	33.8	20.3	45.9	100.0
2000/01	297	193	405	895	2000/01	33.2	21.6	45.3	100.0
2001/02	320	170	402	892	2001/02	35.9	19.1	45.1	100.0
2002/03	200	99	304	603	2002/03	33.2	16.4	50.4	100.0
2003/04	177	125	320	622	2003/04	28.5	20.1	51.4	100.0
2004/05	188	121	307	616	2004/05	30.5	19.6	49.8	100.0
2005/06	237	103	344	684	2005/06	34.6	15.1	50.3	100.0
2006/07	225	107	324	656	2006/07	34.3	16.3	49.4	100.0
2007/08	237	152	352	741	2007/08	32.0	20.5	47.5	100.0
2008/09	228	178	322	728	2008/09	31.3	24.5	44.2	100.0
2009/10	191	116	324	631	2009/10	30.3	18.4	51.3	100.0
2010/11	191	161	344	696	2010/11	27.4	23.1	49.4	100.0
2011/12	150	116	313	579	2011/12	25.9	20.0	54.1	100.0
2012/13	129	141	254	524	2012/13	24.6	26.9	48.5	100.0
2013/14	134	91	331	556	2013/14	24.1	16.4	59.5	100.0
2014/15	168	115	357	640	2014/15	26.3	18.0	55.8	100.0
2015/16	123	102	495	720	2015/16	17.1	14.2	68.8	100.0

We evaluated the numbers of pupils in the categories in each school year and tried to find the trend of progression. It was shown that there had been an increase of swimmers and a decrease in the proportion of pupils afraid of water. Pupils who were able to float (and were not afraid of water) amounted to around 20 % in all 20 years (range 14.2–26.9 %). The trend of progression is depicted in Figure 1.

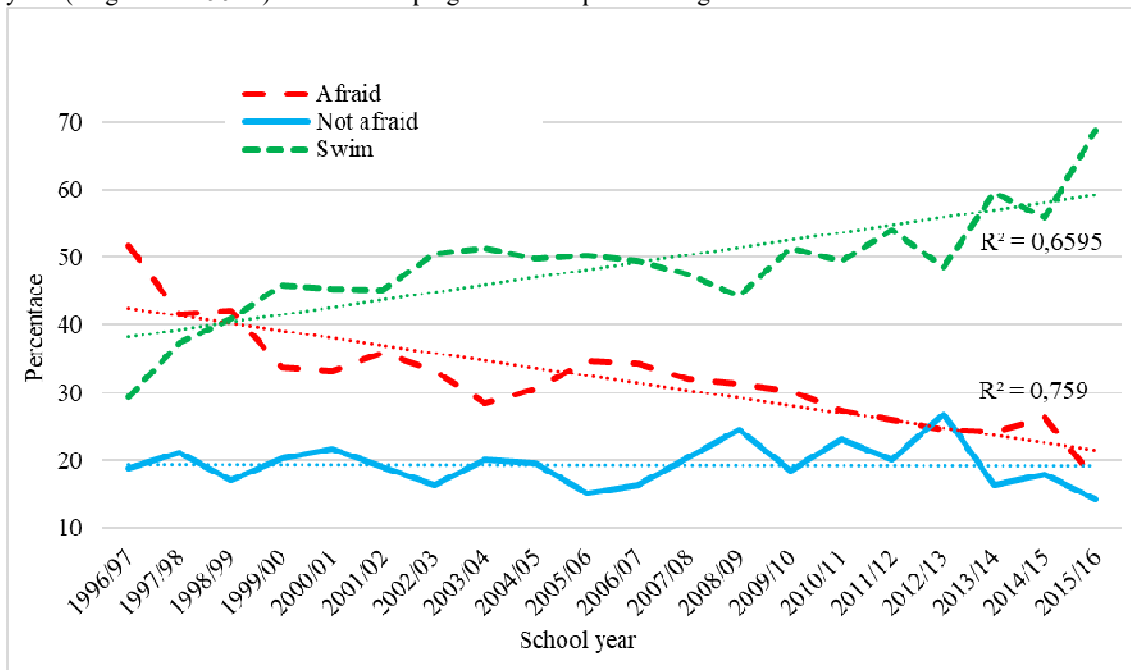


Figure 1 – The trend of the swimming skills of pupils

Next, we evaluated the trend of progression for each category separately in the period before and after 2005 when swimming lessons in schools compulsory by law were removed from the school national curriculum. The results are shown in Figures 2, 3 and 4.

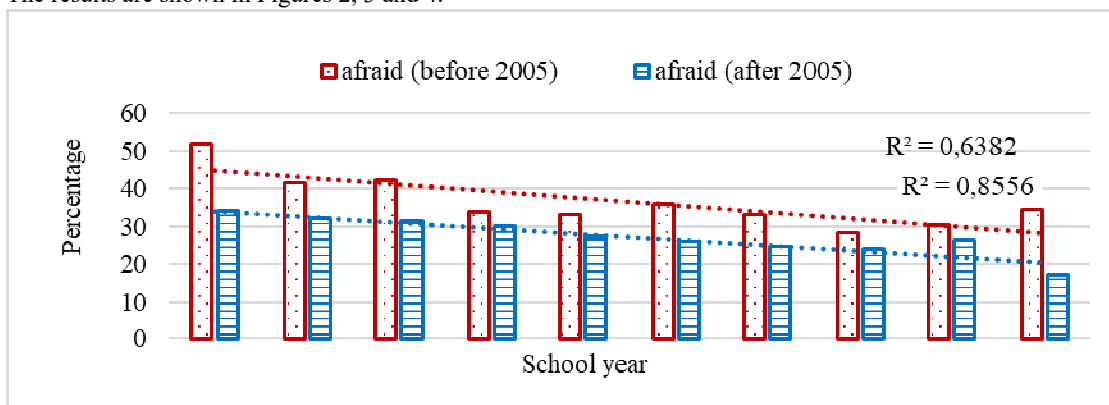


Figure 2 – The trend of progression for the category “afraid” before and after 2005

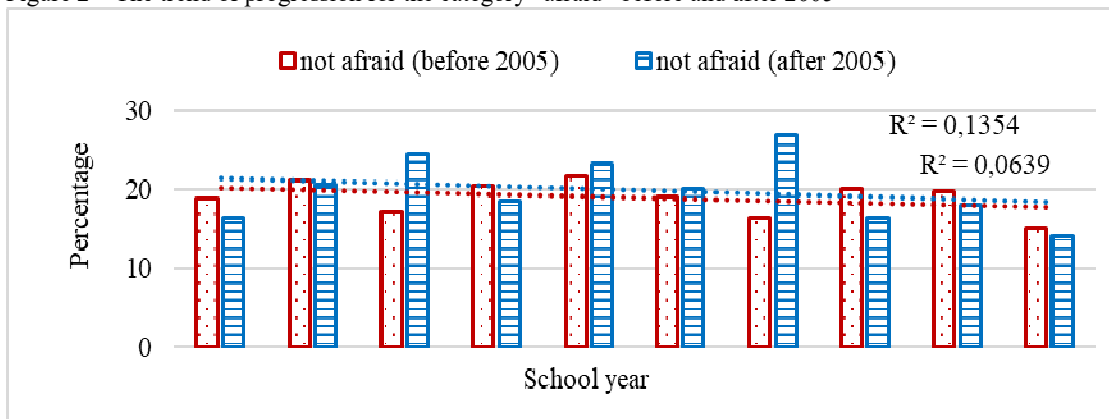


Figure 3 – The trend of progression for the category “not afraid” before and after 2005

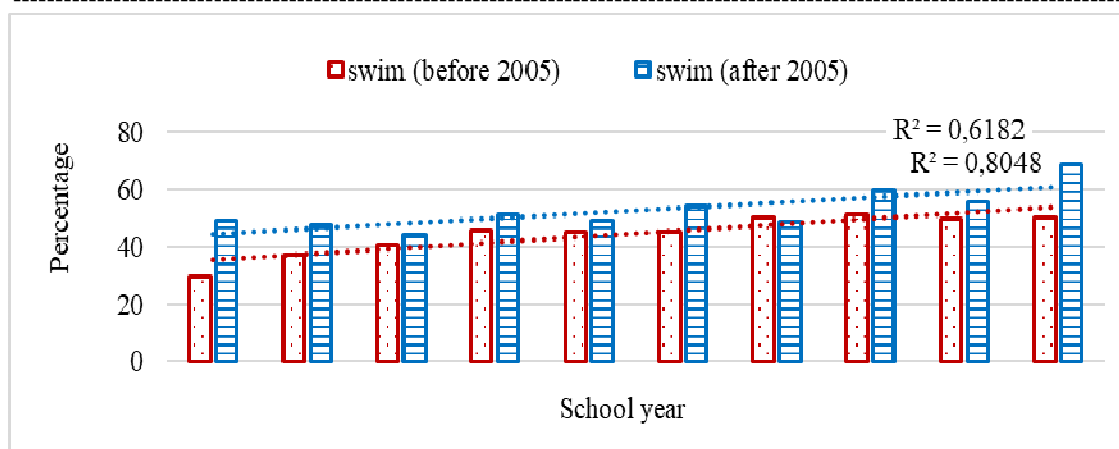


Figure 4 – The trend of progression for the category “swim” before and after 2005

#### Discussion:

In the past twenty years we can track a positive trend in the swimming skills of Brno’s elementary school pupils, even though there is no obligatory course in school or kindergarten education in the Czech Republic. We assume that the source of this development comes mainly from parents and the popularity of water activities among children. These findings are extremely welcome in the light of the low level of physical activity (Kalman et al., 2015) and movement skills among Czech youth. Brno provides appropriate conditions for parents and kindergartens to teach swimming. There are 22 available facilities suitable for children’s swimming (Stloukalová & Roztočí, 2015). Furthermore, this number increased in the years reviewed in this study, in contrast to the population which has not changed significantly (377,973 inhabitants in 2016) (Czech statistical office, 2017). The distance to such facilities is an extremely important factor affecting the number of swimmers in the area (Karusisi, Thomas, Méline, & Chaix, 2013). We believe that the popularity of home pools and other pools also plays an important role in addition to public swimming facilities. The popularity of children’s swimming in Brno illustrates the large number of schools and clubs engaged in this. We were able to find 19 of them on the Internet in 2017. This fact points to the great demand for swimming courses in Brno. According to the national curriculum and the law, swimming lessons were not obligatory for primary school children in the years 2005 to 2017. This raises questions for further study in terms of whether and how exactly this change to the law influenced swimming skills, the popularity of swimming and the popularity of water activities bound closely to basic swimming skills such as canoeing, rafting and diving, for example, in children, and as to whether this is significantly influenced by the social status of the family and the cost of such sports. It is clear there are not any great differences in the trend of progression between the periods before and after compulsory swimming lessons were modified by the law. This progression in swimming skills allows greater use of the water environment in physical education. A great improvement could be made merely by short courses for non-swimmers (Torlaković, 2009). The decreasing number of children who are afraid of water opens up a new area for the use of water games and sport in physical education. Requests for specialised swimming trainers in physical education are declining with the increasing number of child swimmers. We also recommend going outside the bounds of traditional swimming and using the water environment for various games, because fun seems to be an important factor in the willingness of Czech pupils to participate in physical education lessons (Kalman et al., 2015). This approach could increase participation in physical education lessons which is important to the level of physical activity in Czech schoolchildren (Sigmund, Sigmundová, Hamrik, & Gecková, 2014).

This study mapped swimming skills before a school course which usually takes place in year 2 or 3 of elementary school (8–10 years). We do not have widely collected data from Brno about the success of teaching swimming skills. We assume that it is not as great as it might be in view of the absence of any requirement or criteria for lesson quality. There are great possibilities in this area. In Malta, over 90 % of children aged 11 are able to swim (Micallef, Calleja, & Decelis, 2010). To achieve this kind of figure, we support the early inclusion of swimming in the school curriculum. In many cases, a substantial part of a swimming course is spent on overcoming the fear of water. This could be prevented by early contact with the water environment. Moreover, swimming at an early age could add some dimension of personal capital, which could support coping with schools transitions (Jorgensen (Zevenbergen), 2016). This study shows that more and more children begin swimming before school lessons, but this positive change comes from parents and not from the Ministry of Education, Youth and Sports.

#### Conclusion:

The popularity of swimming and the accessibility of swimming facilities in all seasons of the year could have a significant positive influence on swimming skills among schoolchildren. The situation in Brno shows that

even at a time of increasing physical inactivity of children, a positive trend could be traced in some movement skills if the appropriate conditions are provided. Water sports, as appropriate lifelong activities, could be an effective tool in fighting overweight, obesity and other health problems.

#### Acknowledgments:

This research did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

#### Conflict of interest statement:

We have no conflicts of interest to disclose.

#### References:

- Allen, R., Mackey, M. J., & Rollenhagen, B. R. (2016). Which Lifelong Activities Are Held in Highest Regard by Physical Education Stakeholders in Michigan: Can Stakeholders Agree? A Delphi Study. *The Physical Educator*, 73(1). <https://doi.org/10.18666/TPE-2016-V73-I1-5315>
- Biernat, E. (2012). Socio-Demographic Determinants of Participation in Swimming Amongst Working Residents of Warsaw. *Journal of Human Kinetics*, 32(1). <https://doi.org/10.2478/v10078-012-0034-4>
- Cardon, G., Verstraete, S., De Clercq, D., & De Bourdeaudhuij, I. (2004). RESEARCH NOTE: Physical Activity Levels in Elementary-School Physical Education: A Comparison of Swimming and Nonswimming Classes. *Journal of Teaching in Physical Education*, 23(3), 252–263. <https://doi.org/10.1123/jtpe.23.3.252>
- Czech statistical office. (2017, December 31). Demographic trends. Retrieved from [https://vdb.czso.cz/vdbvo2/faces/en/index.jsf?page=profil-uzemi&uzemiprofil=31548&u=\\_VUZEMI\\_43\\_582786#profil31550=page%3Dprofil-uzemi%26rup%3DA%26pvo%3DPU-DEM-OB1%26z%3DT%26f%3DTABULKA%26clsp%3D31550%20http://www.who.int/mediacentre/factsheet/s/fs311/en/](https://vdb.czso.cz/vdbvo2/faces/en/index.jsf?page=profil-uzemi&uzemiprofil=31548&u=_VUZEMI_43_582786#profil31550=page%3Dprofil-uzemi%26rup%3DA%26pvo%3DPU-DEM-OB1%26z%3DT%26f%3DTABULKA%26clsp%3D31550%20http://www.who.int/mediacentre/factsheet/s/fs311/en/)
- Guthrie, S. K., Erickson, S. R., & Lau, M. S. (2013). Comparison of the prevalence and treatment of hypertension in two populations in the United States: Masters swimmers versus the NHANES population. *Journal of Sports Sciences*, 31(9), 930–935. <https://doi.org/10.1080/02640414.2012.757346>
- Jorgensen (Zevenbergen), R. (2016). Early years swimming: A way of supporting school transitions? *Early Child Development and Care*, 186(9), 1429–1437. <https://doi.org/10.1080/03004430.2015.1096785>
- Kalman, M., Hamrik, Z., Sigmund, E., Sigmundova, D., Salonna, F., & National HBSC team, C. (2015). Physical activity of Czech adolescents: Findings from the HBSC 2010 study. *Acta Gymnica*, 45(1), 3–11. <https://doi.org/10.5507/ag.2015.001>
- Karusisi, N., Thomas, F., Méline, J., & Chaix, B. (2013). Spatial accessibility to specific sport facilities and corresponding sport practice: The RECORD Study. *International Journal of Behavioral Nutrition and Physical Activity*, 10(1), 48. <https://doi.org/10.1186/1479-5868-10-48>
- Micallef, C., Calleja, N., & Decelis, A. (2010). Assessing the capabilities of 11-year-olds for three types of basic physical activities. *European Journal of Pediatrics*, 169(9), 1093–1096. <https://doi.org/10.1007/s00431-010-1185-8>
- Peden, M. M., UNICEF, & World Health Organization (Eds.). (2008). *World report on child injury prevention*. Geneva, Switzerland : [New York, NY]: World Health Organization ; UNICEF.
- Penaforte, F. R. O., Calhau, R., Mota, G. R., & Chiarello, P. G. (2015). Impact of short-term water exercise programs on weight, body composition, metabolic profile and quality of life of obese women. *Journal of Human Sport and Exercise*, 10(4). <https://doi.org/10.14198/jhse.2015.104.07>
- Sajadian, M., & Mehr, M. K. (2011). The Effect of Swimming Skill Education on Self-Esteem and Compatibility of Boy's Primary School Students. *Procedia - Social and Behavioral Sciences*, 30, 2225–2229. <https://doi.org/10.1016/j.sbspro.2011.10.434>
- Schwamberger, B., & Wahl-Alexander, Z. (2016). Children's Activity Levels and Lesson Context During Summer Swim Instruction. *The Physical Educator*, 73(4), 733–744. <https://doi.org/10.18666/TPE-2016-V73-I4-6977>
- Sigmund, E., Sigmundová, D., Hamrik, Z., & Gecková, A. (2014). Does Participation in Physical Education Reduce Sedentary Behaviour in School and throughout the Day among Normal-Weight and Overweight-to-Obese Czech Children Aged 9–11 Years? *International Journal of Environmental Research and Public Health*, 11(1), 1076–1093. <https://doi.org/10.3390/ijerph110101076>
- Stanković, S., Marković, Ž., Dopsaj, M., Ignjatović, A., & Aleksić, D. (2016). THE EFFECTS OF A SWIMMING PROGRAM ON THE FUNCTIONAL ABILITIES OF FEMALE STUDENTS. *Facta Universitatis*, 14(3). <https://doi.org/10.22190/FUPES1603427S>
- Stloukalová, B., & Roztoči, T. (2015). Swimming as a part of early childhood education in Czech Republic. *Journal of Human Sport and Exercise*, 10(Proc1). <https://doi.org/10.14198/jhse.2015.10.Proc1.04>
- Thiel, C., Vogt, L., Claußnitzer, G., & Banzer, W. (2011). Energy Cost of Youth Obesity Exercise Modes. *International Journal of Sports Medicine*, 32(02), 142–146. <https://doi.org/10.1055/s-0030-1268436>

- Torlaković, A. (2009). The effects of intensive learning the basic elements of swimming within the frame of extracurriculum activities upon the elementary school children. *Homo Sporticus*, 11(2). Retrieved from [https://s3.amazonaws.com/academia.edu.documents/44073000/Aldvin\\_Torlakovic\\_HomoSporticus\\_-\\_2009.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1558017743&Signature=ONg9F%2FS8s4KiQdfm7ptGD6kCtmM%3D&response-content-disposition=inline%3B%20filename%3DThe\\_effects\\_of\\_intensive\\_learning\\_the\\_ba.pdf](https://s3.amazonaws.com/academia.edu.documents/44073000/Aldvin_Torlakovic_HomoSporticus_-_2009.pdf?AWSAccessKeyId=AKIAIWOWYYGZ2Y53UL3A&Expires=1558017743&Signature=ONg9F%2FS8s4KiQdfm7ptGD6kCtmM%3D&response-content-disposition=inline%3B%20filename%3DThe_effects_of_intensive_learning_the_ba.pdf)
- World Health Organization. (2016, February 12). Obesity and overweight. Retrieved from <https://www.who.int/en/news-room/fact-sheets/detail/obesity-and-overweight>