International Journal of Aquatic Research and Education

Volume 1 | Number 3 Article 9

8-1-2007

The Role of Teaching Swimming in the Formation of a Conscious Healthy Lifestyle

Melinda Bíró
College of Károly Eszterházy, biro_melinda@freemail.hu

Balázs Fügedi
College of Károly Eszterházy

Laszlo Revesz
Semmelweis University

International Journal of Aquatic Research and Education, 2007, *1*, 269-284

The Role of Teaching Swimming in the Formation of a Conscious Healthy Lifestyle

Melinda Bíró, Balázs Fügedi, and László Révész

Swimming plays a particularly important role in the formation of physical, mental, and spiritual well-being and in the preservation of health. The aim of this study was to investigate whether health-based education works through swimming education. A survey was carried out by submitting an anonymous questionnaire to swimming educators ($N = 46$). The sample consisted of people who teach swimming to primary school pupils: physical education teachers, swimming instructors, lifeguards, and swimming coaches (PE teachers 58.7%, instructors and others 41.3%; men 58.7%, women 41.3%). Both a descriptive and a comparative approach were used to analyze data. Based on their inquiry, the authors determined that, unfortunately, those teaching swimming do not commonly consider it important to form health-conscious behavior in their students. It appears that in teaching swimming to children, the principles that are important for the preservation of health in adult age do not predominate.

***Key Words**:* learning to swim, swimming instruction, swimming strokes, teaching techniques

Technological advancements are drastically changing our lives. Unfortunately, the number of people taking part in regular physical activity is decreasing, and lifestyles characterized by a lack of exercise are becoming more and more common (Adams, 2006; Béla Johan National Center for Epidemiology, 2004; Dollman, Norton, & Norton, 2005; European Health for All Database, n.d.; Hungarian Health Database, n.d.; Trends in physical activity, n.d.). According to data compiled by the World Health Organization in 2003, physical inactivity accounts for 2 million deaths worldwide (European Health for All Database). The lack of physical activity in our Western societies threatens to yield grave consequences in childhood and adolescence that can be easily seen in current morbidity and mortality statistics based on national health data (European Health for All Database; Hungarian Health Database; Trends in physical activity) and seem to be resulting from a drastic change in free-time and recreational activities. Lack of exercise

Bíró and Fügedi are with the College of Károly Eszterházy, Inst. of Physical Education and Sport Science, 3300 Eger, Hungary. Révész is with the Faculty of Physical Education and Sport Science, Semmelweis University, 1123 Budapest, Hungary.

presents many dangers such as reduced capacity for work, as well as increased incidence of obesity, diabetes, high blood pressure, metabolic disturbance, behavior problems, and neurosis. We (and you) easily could add more to this list of ailments and lifestyle-related illnesses (European Health for All Database; Health Statistical Annual 2004, 2005; Hungarian Health Database). For example, in Hungary heart and vascular diseases and malignant tumors are reported to be decisively responsible for the poor health conditions among that population (European Health for All Database; Health Statistical Annual 2004; Hungarian Health Database). Their emergence can be traced back to several causes, of which a primary one is lack of exercise (Powers, 2002). Through encouraging regular physical activity participation in physical education programs and using various forms of health counseling, a conscious healthy lifestyle can be promoted (Murray et al., 1994). Unfortunately, the ailments connected to low levels of physical activity and their symptoms are appearing at ever younger ages (British Heart Foundation, n.d.). The most common risk factor for heart and cardiovascular disease, which is high blood pressure, very often starts in adolescence.

Today an increasing number of people suffer from diabetes mellitus, lipid metabolic disturbance, and obesity (Farrell, 2003). In the European Union the number of people with Type 2 diabetes is approximately 25 million (European Health for All Database, n.d.). Fat metabolic disturbance, in which pathologically high cholesterol levels occur, affects two thirds of the adult Hungarian population (Health Statistical Annual 2004, 2005). According to the 1999–2000 National Health and Nutrition Examination Survey (National Center for Health Statistics, n.d.), the prevalence of overweight or obesity in children and youth in the United States is over 15%, a value that has tripled since the 1960s (Ogden, Carroll, & Flegal, 2003). In European Union member states 10–27% of men and more than 38% of women are obese (European Health for All Database). More than 40% of Hungarian adult men and women are overweight (body-mass index 25–29.9 kg/m^2; Health Statistical Annual). The growing tendency toward childhood obesity is especially alarming. The ratio of overweight children in the European Union has reached 20% (European Health for All Database). With advancing age, the percentage of obese people grows. In addition, up to 80% of obese youth are observed to continue this trend into adulthood (Guo & Chumlea, 1999; Whitaker, Wright, Pepe, Seidel, & Dietz, 1997). For overweight people and people who suffer from articular diseases, swimming is highly recommended because it spares joints, increases range of motion, and alleviates or eliminates pain related to movement. Moreover, obesity can usually be prevented by swimming, a physical activity suitable for all ages and physical conditions. Swimming is excellent in the general strengthening of general and varied muscle movement in asthmatic and overweight children (Patkós & Bíró, 2000).

Apart from the previously mentioned diseases, locomotor and psychiatric disorders are appearing at a growing annual rate in the adult population of Western societies. These disorders can partly be connected to an inactive way of life. Regular physical activity diminishes the incidence of many ailments by directly or indirectly lowering their risk factors. Regular physical activity counterbalances the harmful effects of risk factors (La Torre et al., 2006).

Physical activity and regular exercise can help people reach greater physical, mental, and spiritual well-being. They protect from depression, distress, and

sleeping disorders (Calfes & Taylor, 1994). The psychological effects of swimming include adequate and joyful physical activity (e.g., stress-reductive effect, improvement in self-estimation, and body consciousness), as well as protecting one from psychosomatic diseases (e.g., diseases based on mental disorders). Fox (1999), referring to the results of hundreds of examinations, sums up by stating that physical activities such as swimming ameliorate and enhance quality of life, strengthen self-confidence, improve general state of mind and endurance, reduce stress levels, and enhance the ability to sleep soundly.

Numerous epidemiological studies indicate that regular physical activity reduces the risk of cardiovascular mortality and lowers the incidence of heart attack (Berlin & Colditz, 1990; Lee, Hsieh & Paffenbarger, 1995; Paffenbarger, Hyde, Wing, & Hsieh, 1986). Exercise can elevate myocardial antioxidants, as well (Powers et al., 1993, 1998). Swimming has an exceedingly positive effect on the functioning of the respiratory system, such that swimming helps promote the development of a fit heart with efficient myocardial muscle, which can prevent the occurrence of heart disease (Pavlik, Olexo, Osváth, Sidó, & Frenkl, 2001). Swimming causes the heart's capillary system to proliferate (McKirnan & Bloor, 1994; Pavlik et al., 2001, 2005; Tomanek, 1994), thus diminishing the possibility of a heart attack (Hammerman, Schoen, & Kloner, 1983). It improves overall blood circulation, as well.

Engaging in regular sessions of vigorous physical activity such as swimming helps children and young people build and maintain healthy bones, muscles, and joints; helps them control their body weight; helps reduce their percentage of body fat; and develops efficient functioning of the heart and lungs. Swimming as a physical activity has manifold effects. There are two main observable forms that the effects take: physical effects and psychological effects. Swimming causes positive biological changes involving the nerves, muscles, bones, and other organs systems in their functional properties. Its kinetic system has an important healing and rehabilitative role.

Swimming plays an important role in the development of the muscular system and in ameliorating locomotor disorders. The different swimming strokes (e.g., front crawl, backstroke, dolphin-leg stroke) can play a significant role in the formation of the appropriate physiological curves of the spine, strengthening of the lumbar section of the spine, and strengthening of the trunk, the abdomen, and the gluteus muscles.

Altogether it has been established that swimming can play a prominent role in the development of a growing child's many-sided physical and psychological characteristics, in maintaining their health, and in improving quality of life. Swimming can be indispensable in the health and fitness education of growing children, but it also can play a significant role at later ages in health preservation and in maintaining adequate physical and mental status. All these characteristics justify the fact that swimming should be given a special role in the physical education curriculum. More children should learn to swim so that when they are adults, they can use swimming to promote continued health and fitness.

Recently there have been extensive discussions in Hungary about the importance and need for health promotion, we think indicating as a society that we are concerned with promoting a healthier way of life. The recreational, rehabilitative, and health role of swimming has come to the fore. In Hungary it prevails to a greater

extent because the state of health of the population is significantly worse than can be accounted for by the country's economic and social levels of development. For the purposes of this article, we consider swimming as a tool to understand whether adults' healthy lifestyle behaviors can be encouraged while simultaneously they learn swimming skills. We regard swimming as potentially serving a very important role in health education in the teaching of a healthy way of life, as well as in the formation of a healthy view toward an active lifestyle. We think for this reason that swimming should play a special role in the general educational program, so that it can contribute to the formation of a health-conscious way of life for the younger generation.

Purpose

Based on the specific literature that we have consulted and cited in this article, it is apparent that regular physical activity is decreasing in Hungarian society, even though physical activity such as swimming has been demonstrated in several studies to promote good health. Our study had several aims, including

- Investigating what factors characterize the choice of the swimming stroke that is first taught
- Identifying the most important factors that influence the choice of swimming strokes that are taught and which swimming strokes instructors find easy or difficult to teach
- Determining whether swimming teachers base their choice of which swimming stroke to teach on health-preservation concerns or the ease of motor-skill acquisition

Hypothesis

We propose the primary hypothesis that most swimming instructors tend to give a strong preference to lifesaving considerations when they choose which swimming strokes to teach. Our alternative hypotheses are that swim instructors do not take either methodological or health considerations into account when considering which swimming strokes to promote and teach first and that they should. We assume that swimming teachers most often do consider demonstrated and supported professional viewpoints and other advice when choosing how and when to teach swimming strokes. We also presume that considerations for long-term health promotion do not play major roles in the selection of which swimming strokes to teach.

Method

Participants

The volunteers who consented to participate in our study included 46 individuals: 27 physical education teachers, 2 swimming trainers, 13 swimming instructors, and 4 lifeguards, of whom 58.7% were women and 41.3% were men. They all taught elementary school students. The least amount of time spent teaching swimming

among them was 1 year, and the longest was 28 years ($M = 9.28 \pm 8.04$). Of the surveyed instructors, 34.8% had teaching experience of 1–3 years, 26.1% had taught for 4–9 years, 19.6% had 10–19 years of experience, and 19.6% had over 20 years of teaching experience. Of the people involved in teaching swimming, 39.1% did not have special corresponding qualifications, but 60.9% of them did have special coaching qualifications. All of the surveyed physical education teachers taught swimming in their physical education lessons. According to the responses, 57.9% of instructors gave swimming instructions as private entrepreneurs, 36.8% of them did it in sports clubs, and 21.1% of them did not belong to any organizations. All of the respondents teach pupils from the first 4 years of primary school, but only 63.15% of them teach pupils from 5 to 8 years of age. In addition, 84.2% of swimming-instructor respondents also teach other age groups apart from primary school, such as nursery school pupils. None of the physical education teachers do so. Of those surveyed, 42.1% teach secondary school students. The results suggested that that the main age group of 6- to 11-year-olds was ideal for teaching motor skills and swimming.

Examining the regularity and the time spent on teaching swimming, we noted that for most of the instructors (68.42%) teaching has a seasonal character, whereas for physical education teachers, it is more common to see regular (once-a-week) swimming lessons (77.8%). For instructors regular, weekly courses are somewhat rare—only 31.6% of them said that they lead such courses. Instructors conduct fewer swimming lessons per year ($M = 15.8 \pm 5.5$) than do physical education teachers, who teach many more ($M = 27.8 \pm 13.7$). For instructors the most common pattern is a 12-lesson course, indicated by 47.4% of them, whereas physical education teachers generally provide 35-lesson courses, chosen by 51.85% of them. Of instructors, 84.2% work with ideal group sizes, as suggested by the specialized literature we reviewed, of 12–15 students. Of the instructors, 42.1% conduct classes with as few as 8–10 students, and 42.1% have 12–16 students per group. In contrast, physical education teachers, in most of the cases (37.03%), teach swimming to 20–25 students at a time. Of all surveyed teachers, 62.95% work with groups that have more students than is ideal, and only 37.02% of them teach groups with fewer than 16 students.

Survey Questionnaire

For our survey we used the indirect method of questioning of a questionnaire. A questionnaire was developed for the present study and tested in a pilot study. The three types of questions on the survey were simple factual, demographic questions to disclose the participant's age, qualification, and years spent in practice; completely open-ended questions to reveal the opinion of the participant in connection with swimming; and questions requiring ordering the importance of listed items on the characteristics of teaching swimming.

Data Analysis

Both a descriptive and a comparative approach were used to analyze the data. The qualitative data were coded, categorized, and grouped into themes to clarify the specific questions for the questionnaire and to discover significant areas to study.

With the quantitative data, descriptive and appropriate nonparametric statistics were calculated using the SPSS 13.0 for Windows statistical package. In the current study we analyzed only a few questions directly connected with our purpose of examining the promotion of healthy adult lifestyle knowledge and behaviors during swimming-instruction programs.

Results

Choice of the Swimming Stroke Taught First

We examined which swimming stroke the surveyed physical education teachers and instructors teach first. Among the possible answers on the questionnaire, there were several categories including breaststroke, backstroke, and front crawl, as well as the combination of different strokes. From the answers given, we established that in our observed sample, most of the participants who teach swimming (76.1%) start with teaching breaststroke, and only 6.5% of them start with front crawl. It is worthy of note that nobody in our sample chose to teach backstroke first. This does not necessarily mean that nobody actually starts with teaching the backstroke. We examined the answers concerning teaching several combinations of strokes, examining whether backstroke figures into initial stroke instruction. Of all teachers and instructors, 17.4% teach several strokes at the same time. Those who teach several strokes chose four different combinations. Of these, there were two that were most common: when the three different swimming styles were taught at the same time and when two strokes, front crawl and backstroke, were taught simultaneously. Both variations were chosen by an equal, but very small, percentage (6.5%) of swimming instructors in our sample. The other two combined-stroke instructional groupings were the 2.2% of teachers who chose breaststroke and backstroke and another 2.2% who taught breaststroke and front crawl at the same time.

When we examined the differences between physical education teachers and other swimming instructors, we saw that Hungarian physical education teachers gave preference to teaching the breaststroke. None of the physical education teachers in our survey started swimming instruction with the front crawl or backstroke. When teaching several styles they gave preference to the variations in which the breaststroke is taught with other strokes. Almost two thirds (63.15%) of the general swimming instructors also prefer teaching breaststroke first. On the other hand, 15.8% of them chose to teach the front crawl as the first swimming style. We did not find a statistically significant difference between physical education teachers and swimming instructors ($p \leq .118$) in their choice of which swimming stroke they taught first—both groups gave a strong preference to breaststroke.

The Order of Difficulty of Swimming Strokes

We also asked the surveyed physical education teachers and general swimming instructors which swimming stroke they found easy or difficult to teach. We asked them to order the difficulty of teaching on a scale of 1 to 5, with 1 being *easiest* and 5 *most difficult*. Based on the descriptive mean results (means of breaststroke, 3.14; backstroke, 3.02; and front crawl, 2.82) the respondents ranked teaching the breaststroke as most difficult (3.14). It is noteworthy that in spite of this difficulty

rating, most (76.1%) respondents still start swimming education by teaching the breaststroke. It was also interesting to note that respondents ranked teaching the front crawl as the easiest of the three swimming styles ($M = 2.82$). Only 6.5% of them, however, start swimming instruction by teaching this stroke.

If we compare and contrast the average combined rating given by swimming instructors and physical education teachers, we can see that the physical education teachers rated the different swimming strokes as more difficult to teach than the instructors did. The swimming instructors' ranked order of difficulty, from hardest to easiest, was breaststroke, backstroke, and front crawl, and for physical education teachers, it was backstroke, breaststroke, and then front crawl. Swimming instructors said that they found breaststroke more difficult to teach (instructors, 3.21; physical education teachers, 3.07), and physical education teachers found backstroke the most difficult (instructors, 2.79; physical education teachers, 3.15). These observed mean differences were not statistically significant, however, so one needs to consider how widely the estimates of difficulty varied among study respondents.

Of the three swimming strokes taught first, members of both groups reported teaching the front crawl to be the easiest; it received almost identical ratings (instructors, 2.68; physical education teachers, 2.89) across the two respondent groups (Table 1).

We also examined whether having swimming-related corresponding qualifications influenced the ordering of the different swimming styles according to difficulty. We can establish that respondents with or without special qualifications gave significantly different opinions solely in the case of backstroke ($p \leq .035$).

Table 1 Difficulty of Teaching Swimming Styles

Qualification	Breaststroke	Front crawl	Backstroke
Physical education teacher, $n = 27$			
M	3.070	2.890	3.150
SD	1.072	0.892	0.907
minimum	1	1	2
maximum	5	4	5
variance	1.148	0.795	0.823
Swimming instructor, $n = 19$			
M	3.210	2.680	2.790
SD	1.357	1.157	1.134
minimum	1	1	1
maximum	5	4	4
variance	1.842	1.339	1.287
Total, $N = 46$			
M	3.130	2.800	3.000
SD	1.185	1.003	1.011
minimum	1	1	1
maximum	5	4	5
variance	1.405	1.005	1.022

Note. Ratings were on a scale of 1 to 5, 1 being *easiest* and 5 *most difficult.*

Reasons for Choosing the Swimming Stroke Taught First

In the choice of the order of teaching the different swimming styles we have to take the following into consideration: the mobility requirements of the stroke, the students' age, their mobility (joint flexibility), their previous swimming-education experiences, the number of students per group, the number of lessons spent on swimming education, safety aspects, and last but not least, the application of a health-conscious approach as a basis. We measured the grounds on which respondents claim to have chosen a certain stroke to teach first (Tables 2 and 3), and we analyzed how much a health-conscious choice dominates. Respondents were asked to rate items on a scale of 1 to 7, 1 being *most important* and 7 being *having the least impact*. In our sample they reported having chosen the swimming stroke that they teach according to age ($M = 2.590 \pm 1.185$), mobility structure ($M = 2.700 \pm 1.618$), and usefulness (i.e., water safety and lifesaving aspects, $M = 2.910 \pm 2.239$). This was followed by the choices of swimming stroke according to previous education ($M = 3.500 \pm 1.346$). Finally, they rated choices according to the number of students per group ($M = 5.000 \pm 1.382$), as well as according to the number of lessons ($M = 5.090 \pm 1.603$). According to the responses by this group, the least influential point of view influencing the choice of swimming stroke to teach was the one based on health-conscious education ($M = 6.070 \pm 0.975$).

Table 2 Reasons for Teaching a Swimming Stroke First, *N* = 46

Reason	*M*	*SD*
Mobility structure	2.70	1.618
Age	2.59	1.185
Previous education	3.50	1.346
Number of lessons	5.09	1.603
Usefulness	2.91	2.239
Health-conscious education	6.07	0.975
Number of students	5.00	1.382

Note. Ratings were on a scale of 1 to 7, 1 being *most important* and 7 being *having the least impact*.

Table 3 Significance Level of Answers (Using χ^2 of Independence Test) to Why Participants Chose a Swimming Stroke to Teach First

Reason	Chi-square	*df*	Asymptotic significance
Mobility structure	25.826	6	.000
Age	32.000	5	.000
Previous education	17.913	5	.003
Number of lessons	6.696	5	.244
Usefulness	24.696	5	.000
Health-conscious education	37.696	4	.000
Number of students	12.696	5	.026

Manifestation of Health Consciousness

For our present examination the most interesting aspect in the choice of swimming stroke is the one based on health-conscious education. As we have already mentioned, in the choice of the swimming stroke to teach, health consciousness was ranked last of all in importance by the respondents ($M = 6.070 \pm 0.975$). We can see in Table 4 that the number of years spent teaching swimming does not change this. We can also observe that according to the ratings, the health-centered choice is only third best.

We did not find a significant difference between instructors and teachers regarding their qualifications ($p \leq .69$) from the point of view of the application of health consciousness. Therefore, we can establish that in our sample, education promoting physical activity and the formation of health-conscious behavior was

Table 4 Effects of Years Spent in Education on Health-Based Teaching

Number of years spent in education	Statistic	*SE*
1–3	$M = 6.00$	0.289
	variance = 1.333	
	$SD = 1.155$	
	minimum = 3	
	maximum = 7	
	skewness = –1.485	0.564
	kurtosis = 2.120	1.091
4–9	$M = 6.08$	0.149
	variance = 0.265	
	$SD = 0.515$	
	minimum = 5	
	maximum = 7	
	skewness = 0.211	0.637
	kurtosis = 2.220	1.232
10–19	$M = 6.11$	0.309
	variance = 0.861	
	$SD = 0.928$	
	minimum = 5	
	maximum = 7	
	skewness = –0.263	0.717
	kurtosis = –2.018	1.400
>20	$M = 6.11$	0.423
	variance = 1.611	
	$SD = 1.269$	
	minimum = 3	
	maximum = 7	
	skewness = –2.146	0.717
	kurtosis = 5.354	1.400

definitely not considered by physical education or swimming instructors when deciding with which stroke (or strokes) to begin instruction.

Discussion

We think that almost everyone can agree that the formation of a health-conscious system of habits has to be started at a very early age, preferably during the nursery and primary school years. We cannot leave out the formation and founding of a health-conscious way of life from the forming identity of the younger generation. That is why we concentrated on this age group in our study. One of the possible tools for promoting a health lifestyle and health consciousness is the use of swimming as a physical activity. One important advantage of using swimming to promote health consciousness is that we can start the process of familiarization with water at ages younger than 4 or 5 years, and afterward we might start teaching the swimming strokes that are simpler in their coordination patterns. If swimming as a physical activity becomes part of young people's system of habits and it becomes more automatic, we think that we will have taken a big step toward promoting a health-conscious way of life.

Health-sociological research tells us about the unequal distribution of health among different social groups. The concept of health and even its content elements are defined in different ways according to regions or areas (North America, Western and Eastern Europe), countries, settlements, and even according to social and demographic groups (young people, the elderly). Certain areas, countries, and regions can organize systems for and from their own health-education programs taking into account their special needs, circumstances, and possibilities. That is what they do in our region of Hungary, in Eger, where the town municipality, in the interest of forming a health-conscious way of life and keeping local customs and traditions in mind, motivates educational institutions financially. We examined how swimming education was conducted in our locality and how much the concept of healthy lifestyles dominates. Our study showed that swimming, with its long-term potential contribution to preserving health, did not receive enough attention during education, at least as viewed from the types of choices that swimming instructors make when choosing swimming strokes to teach. In our sample (physical education teachers and swimming instructors who teach children outside of school) health-conscious swimming education was not realized as fully as it might be, again as measured by choice of stroke.

In the choice of the swimming stroke they teach first, most (76.1%) of the 46 respondents to the survey started teaching swimming with breaststroke—even though they also rated it as more difficult to teach. We concluded from these findings that most people who teach swimming gave a greater preference for promoting water safety and lifesaving aspects when they chose a swimming style to teach. Lifesaving aspects justify the priority of teaching the breaststroke. With this stroke, one can swim with the least effort and cover the longest distance with minimal energy expenditure. The leg stroke for treading water is based on that of the breaststroke, which is indispensable in many cases because it is the basic motion used when rescuing people from water and because this coordination pattern is ideal when one wants to stay on the surface of the water with the least effort. When rescuing people

from water, most of the carrying swimming stroke is based on the breaststroke's leg kick. The breaststroke is also more advantageous in terms of orientation than the other styles because when doing the front crawl, the swimmer breathes at the sides, so orientation is only relative. Lifting the head forward requires more effort (because of biomechanical reasons), so the swimmer gets tired sooner, and in the case of backstroke spatial orientation is more difficult because the swimmer lies on his or her back. In our observed sample, these points of view justified the priority of choosing breaststroke as the first swimming stroke to teach.

We think it is remarkable that in our sample nobody chose the backstroke as the first style to teach. The surveyed people only teach the backstroke as the second or the third swimming style. They do not teach it alone as a first style and only teach it when they start with teaching several swimming styles together. Only 14.9% of teachers and instructors do so. Analyzing the teaching of variations of several strokes, we can say that no physical education teacher started with the front crawl or backstroke. In primary schools where physical education teachers most often teach swimming, they usually only have 1 school year at their disposal, Apparently it was feared that students would only learn the breaststroke and that they would not learn the other styles, which are perhaps more important from the point of view of health, according to our way of thinking. Physical education teachers who taught combinations of swimming styles preferred teaching combinations that included the breaststroke. Most of the swimming instructors (63.15%) also preferred teaching the breaststroke first. Because they usually teach short courses of instruction and they only use a few lessons, it might be feared that they will not have the time and opportunity to teach the other strokes.

From our results we can ascertain that the people surveyed usually chose the initial swimming stroke according to its coordination pattern or according to the age of the students. It was interesting because the two are closely connected, we think. At the same time there was a contradiction because if they choose the swimming style according to either age or coordination, they logically should not choose the breaststroke. When they choose the order of the styles that they want to teach, they do it according to the stroke's coordination pattern. Simpler coordination patterns such as the crossed and cyclical movements of the front crawl and backstroke are inseparable from the child's ontogenetic development, which is why the teaching of these alternating strokes is not only possible but also much easier than teaching the more complicated, noncyclical movements of breaststroke. We can start teaching swimming styles with simpler coordination patterns at the age of 4 or 5 because of the developmental level of the nervous system and cognitive abilities at that age. Normally, however, learning the breaststroke requires more swimming experience and a more highly developed nervous system. That is why we think that age and coordination pattern are closely connected. We think that which stroke to teach at what age follows from what we have discussed here. It is closely connected to the stroke's coordination and the development of the nervous system. At a younger age front crawl and backstroke are recommended. Learning the breaststroke requires a more highly developed nervous system, which is why we have observed it to be easier to learn the breaststroke at a somewhat later age (7–8 years). Therefore, it is inconsistent that the instructors surveyed referred to coordination and age, which would justify teaching the front crawl and backstroke rather than breaststroke first.

According to our results, which are based only on the instructors surveyed and might not be generalizable to others, the fourth-rated point of view determining the choice of stroke was the students' flexibility and previous educational experiences. The basic exercises used to promote water orientation and accommodation (e.g., submerging, exhaling, floating), the different forms of gliding (front and back), or previous knowledge of a stroke occasionally might determine which stroke the teacher or instructor starts with. One can start teaching based on an assumption about previous knowledge but might need to change one's approach depending on the needs of the individual students. If some of the students are familiar with one swimming stroke, the teacher can take that fact into consideration and might teach another stroke that is new for everyone in the group. We speculate that this approach might have several advantages such as that the difference in knowledge among students might be reduced.

Those surveyed reported that their lowest ranked reason for choosing the stroke to teach first was based on the number of students per group and the number of lessons involved. We thought that these factors might actually have greater influence on the choice of stroke than the respondents rated because it is clearly different if a teacher has 12 or 35 lessons in which to teach skills. With more lessons, the more difficult breaststroke or several strokes can be taught. According to some teachers (Arold, 1989), it is not advisable to teach breaststroke with a larger group.

Contrary to our hypothesis and expectations, our survey results showed that the least important aspect determining the choice of swimming stroke to teach first was health. None of the people surveyed ranked health as first or second, and most (82.6%) ranked it last or next to last. Although this low priority is disappointing to us personally, it should not be surprising because most swimming and physical education instructors are more interested in the immediate results of promoting swimming skills than the long-term health consequences.

Conclusions

We have emphasized the preventive and multifactorial beneficial health role that swimming as a physical activity can play in forming and improving health-conscious behavior and eventually promoting a healthy lifestyle. We also stressed the usefulness of swimming as a physical activity in relation to improving and preserving lifelong health and wellness. We argued that swimming education from this perspective of promoting health consciousness has not been obvious or deliberate among physical education or swimming instructions. We fervently believe that it should be strengthened among our colleagues and countrymen. We believe that the transmission of health knowledge and the knowledge of the advantages of swimming and its potential role in long-term health improvement have obviously been insufficient in teacher training, at least among those whom we surveyed in our sample.

To emphasize the healthy aspects of swimming, we recommend that changes be made in the teacher-training education curricula, as well as in the continuing education of professionals. We think that we need to assist physical education

teachers and swimming instructors through professional teacher-training communication activities to understand the importance of swimming to a much greater extent. We need to awaken children's, parents,' and other teachers' consciousness to the long-term positive effects of swimming.

Of course we realize that many view swimming education as serving primarily as the base for developing competitive swimming. From our point of view, the education of competitors should not be either the primary or the ultimate aim of good swimming instruction. The aim should be the provision of valuable, necessary physical activity and the promotion of long-term health preservation.

In our opinion, the pedagogical and health-related objectives and benefits should be the most important in swimming education. Before starting the swim-teaching process and before choosing which swimming stroke (or strokes) one wishes to teach first, instructors should consider all the salient factors that might affect their choices. We recommend that the teacher or instructor take into consideration what exactly might be best for the child in the long run. Our aim is to provide children a wider swimming-stroke repertoire by the time they grow up, so even if they develop locomotor disorders or other ailments, or simply want to swim to maintain or improve their health, they could choose from several different swimming strokes. We can ensure this by teaching multiple strokes to our students.

It is our studied opinion that from the point of view of health-conscious physical activity, two strokes (front crawl and backstroke) ought to be emphasized. We recommend the following: If we only have the means to teach one stroke and water safety is the aim, we probably should teach the breaststroke. From both the point of view of increasing physical activity and health promotion, it is expedient to teach several strokes. At the same time students have to understand the usefulness and advantages of each of the different strokes. Thus we recommend teaching several strokes together and simultaneously (see Table 5). Reasons to teach all three strokes together include the following:

- It is most advantageous to teach the three different swimming strokes from all points of view.
- Students can learn all three strokes, so later they can choose from a wider repertoire of strokes.
- By learning all the strokes, students can enjoy the advantages of all three.
- More lessons are needed to teach the three different strokes simultaneously.
- The three different strokes have differing breathing techniques, body positions, and coordination patterns, so a developmental schema is possible.

We also recommend applying the preventive point of view in swimming education. We think that it is time to make swimming available to everyone because of its multiple purposes and applications. We further think that we can reach this aim through health-conscious swimming education for the younger generation. Swimming education can be started at a very early age, and swimming is a physical activity that can be successfully enjoyed at an older age in the interest of health promotion.

Table 5 Reasons for Teaching Paired Strokes Together

Paired swimming strokes taught	Reasons for choosing swimming-stroke pair
Front crawl and backstroke	Both are simple, cyclical motions; have similar mobility structures; are easy to teach; and can be taught successfully in case of fewer lessons.
	They have an almost identical leg stroke, which eases teaching.
	It is possible to teach both strokes at an early age (4–5 years) based on the developmental level of the nervous system.
	For younger students, they are easier to learn than breaststroke.
	These strokes do not burden the lumbar section of the spine.
	These two strokes are used in cases of most locomotor disorders.
Front crawl and breaststroke	They can be taught successfully with larger groups, when the students have differing previous swimming education and knowledge.
	When students have previous knowledge of the front crawl, and because of its usefulness, we decide to teach breaststroke—their simultaneous teaching is not only possible but recommended.
	Teaching these two strokes is recommended because they are the swimming strokes used in water rescues.
	There might be educational problems arising from the facts that the two strokes' mobility structures are different, the leg stroke requires opposite positions of the feet, and breathing is different, which might lead to mistakes in breathing technique in the front crawl.
Backstroke and breaststroke	They are advantageous from the point of view of usefulness and health.
	They are excellent for larger or heterogeneous groups (regarding the previous knowledge of a stroke).
	In both cases, the head can be positioned above the surface of the water (though not advisable with the breaststroke).
	They are advantageous when taking individual differences into consideration.
	From the point of view of rescuing, breaststroke is the best, and from the point of view of health, backstroke is the most advantageous, so the combination of these two strokes is excellent.
	There might be educational problems arising from the facts that the two strokes' mobility structures are different and the leg stroke requires opposite positions of the feet.

References

Adams, J. (2006). Trends in physical activity and inactivity amongst US 14–18 year olds by gender, school grade and race, 1993–2003: Evidence from the youth risk behavior survey. *BMC Public Health*, *6*(57), doi:10.1186/1471-2458-6-57. BioMed Central Web site. Retrieved July 29, 2006, from www.biomedcentral.com/1471-2458/6/57

Arold, I. (1989). *Teaching swimming.* Sport, Budapest, 15-24.

Béla Johan National Center for Epidemiology. (2004). Retrieved June 23, 2006, from www.oek.hu/oek.web?to=8&nid=168&pid=1

Berlin, J.A., & Colditz, G. (1990). A meta-analysis of physical activity in the prevention of coronary heart disease. *American Journal of Epidemiology, 132,* 612-628.

British Heart Foundation. *Trends in physical activity.* Retrieved April 25, 2006, from http://www.heartstats.org/datapage.asp?id = 984

Calfes, K.J., & Taylor, W.C. (1994). Effects of physical activity on psychological variables in adolescents. *Pediatric Exercise Science, 6,* 406-423.

Dollman, J., Norton, K., & Norton, L. (2005). Evidence for secular trends in children's physical activity behaviour. *British Journal of Sports Medicine, 39,* 892-897.

European Health for All Database. (n.d.). Retrieved June 8, 2006, from www.euro.who.int/hfadb

Farrell, P.A. (2003). Diabetes, exercise and competitive sports. *Sports Science Exchange, 16,* 3. Retrieved July 22, 2006, from www.gssiweb.com/reflib/refs/622/sse90.cfm?pid=38

Fox, K.R. (1999). The influence of physical activity on mental well-being. *Public Health Nutrition, 2*(3A), 411-418.

Guo, S.S., & Chumlea, W.C. (1999). Tracking of body mass index in children in relation to overweight in adulthood. *American Journal of Clinical Nutrition, 70*(1 Pt. 2), 145-148.

Hammerman, H., Schoen, F.J., & Kloner, R.A. (1983). Short-term exercise has a prolonged effect on scar formation after experimental acute myocardial infarction. *Journal of the American College of Cardiology, 2,* 979-982. Retrieved June 20, 2006, from http://content.onlinejacc.org/cgi/content/abstract/2/5/979?maxtoshow=&HITS=10&hits=10&RESULTFORMAT=&fulltext=swimmingandorexactfulltext=and&searchid=1&FIRSTINDEX=0&sortspec=relevance&resourcetype=HWCIT

Health Statistical Annual 2004. (2005). Budapest, Hungary: Central Statistical Agency.

Hungarian Health Database. (n.d.). Retrieved June 15, 2006, from www.eski.hu/index_en.html

La Torre, G., Masala, D., De Vito, E., Langian, E., Capelli, G., Ricciardi, W., & PHASES (PHysical Activity and Socio-Economic Status) collaborative group. (2006). Extracurricular physical activity and socioeconomic status in Italian adolescents. *BMC Public Health*, *6*(22), doi:10.1186/1471-2458-6-22. Retrieved June 14, 2006, from www.biomedcentral.com/1471-2458/6/22

Lee, I.M., Hsieh, C., & Paffenbarger, R. (1995). Exercise intensity and longevity in men. The Harvard Alumni Health Study. *JAMA, 273,* 1179-1184.

McKirnan, M.D., & Bloor, C.M. (1994). Clinical significance of coronary vascular adaptations to exercise training. *Medicine and Science in Sport and Exercise, 26,* 1262-1268.

Murray, D.M., Hannan, P.J., Jacobs, D.R., McGovern, P.J., Schmid, L., Baker, W.L., & Gray, C. (1994). Assessing intervention effects in the Minnesota Heart Health Program. *American Journal of Epidemiology, 139*(1), 91-103.

National Center for Health Statistics. (n.d.). Retrieved July 13, 2006, from www.cdc.gov/nchs/about/major/nhanes/survey_results_and_products.htm

Ogden, C.L., Carroll, M.D., & Flegal, K.M. (2003). Epidemiologic trends in overweight and obesity. *Endocrinology and Metabolic Clinics of North America*, *32,* 741-760.

Paffenbarger, R.S., Hyde, R., Wing, A., & Hsieh, C. (1986). Physical activity, all-cause mortality, and longevity of college alumni. *New England Journal of Medicine, 314,* 605-613.

Patkós, É., & Bíró, M. (2000). *Role of swimming in health development in school-aged children (Hungarian)* [Unpublished thesis]. Budapest: Hungarian University of Physical Education and Sport Science.

Pavlik, G., Kemény, D., Kneffel, Z., Petrekanits, M., Horváth, P., & Sidó, Z. (2005). Echocardiographic data in Hungarian top-level water polo players. *Medicine and Science in Sport and Exercise, 37,* 323-328.

Pavlik, G., Olexo, Z., Osváth, P., Sidó, Z., & Frenkl, R. (2001). Echocardiographic characteristics of male athletes of different age. *British Journal of Sport Medicine, 35,* 95-99.

Powers, S.K. (2002). Exercise, antioxidants and cardioprotection. *Sports Science Exchange*, *15*(2). Retrieved June 13, 2006 from www.gssiweb.com/reflib/refs/567/85PDF.cfm?pid=38

Powers, S.K., Criswell, D., Lawler, J., Martin, D., Lieu, F., Ji, L., & Herb, R.A. (1993). Rigorous exercise training increases superoxide dismutase activity in ventricular myocardium. *American Journal of Physiology, 265,* 2094-2098.

Powers, S.K., Demirel, H., Vincent, H., Coombes, J., Naito, H., Hamilton, K., et al. (1998). Exercise training improves myocardial tolerance to in vivo ischemia-reperfusion in the rat. *American Journal of Physiology, 275,* 1468-1477.

Tomanek, R.T. (1994). Exercise induced coronary angiogenesis: A review. *Medicine and Science in Sports and Exercise, 26,* 1245-1251.

Trends in physical activity. (n.d.). British Heart Foundation. Retrieved June 14, 2006, from www.heartstats.org/datapage.asp?id=984

Whitaker, R.C., Wright, J.A., Pepe, M.S., Seidel, K.D., & Dietz, W.H. (1997). Predicting obesity in young adulthood from childhood and parental obesity. *New England Journal of Medicine, 337,* 869-873.