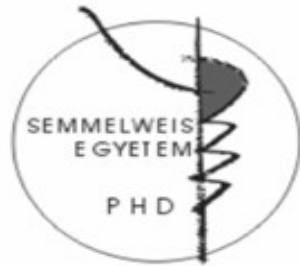


# **Effect of group swimming therapy on anxiety, physical self concept and motor abilities on children with functional spinal disorders**

**PhD thesis**

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## **I. Introduction**

The author has been teaching swimming and therapeutic swimming for 12 years since graduating as an Adapted PE teacher. The applied teaching method the author used is built on the knowledge he gained from the excellent swimming specialists who taught him in the Teacher of Physical Education Course (swimming specialization), and when he became a teacher of swimming. This qualification and practice were supplemented with the acquiring of latest posture correcting exercises studied in therapeutic swimming lessons in the Adapted PE Course. Children can profit from therapeutic swimming, as the National Health Insurance Fund (OEP) supports therapeutic group swimming treatment for children under 18, and for those companies which have a contract with it. This support was the result of a 15-year struggle undertaken by specialists in body culture, sport and sport therapy. The fact that group swimming therapy has been accepted as a therapeutic method since 1983 by the National Health Insurance Fund should be preserved and further developed.

The inactive lifestyle and high level of anxiety found among people in societies of the globalized world result has resulted in harmful and dangerous changes in terms of physical and mental health. As a consequence of the sedentary lifestyle common in current everyday life, the number of people in which scoliosis has appeared has increased. Parallel with the development of mass- and mobile communication, the chance of the onset of postural deformity has increased. Proportionally less time is spent on movement and social relations. The fight for an existence (career) and the fulfilling of ever increasing expectations are causes of the onset of mental and psychosomatic problems. It is important to offer children activities to improve their awareness of movement culture where effective health preservation and health promotions programs are carried out. This gives children the chance to avoid or improve their incorrect body posture and avoid circulatory-respiratory problems; thus, the young will have a healthy personality free of complexes. They will become grown-ups, and later, the managing of their physical and mental health will form part of their personality and will be an intrinsic need for them.

Adapted PE has a long history in the rehabilitation of traumatic, orthopaedic and cardiology problems. It is bronchial asthma that appears most frequently as a chronic disease with children. Therapeutic swimming as a method of improving quality of life has been investigated since the 1970s as a therapeutic method in the treatment of children with asthmatic and functional spinal column problems. As a result of these methods a decrease in anxiety and an improvement in quality of life can be observed.

## II. Aims

*The main target of the research was to examine the effect of group swimming therapy and swimming therapy based complex sport therapeutic program on motor skills development and emotional characteristics of 8-11-year-old children.*

A sample of lower primary school children was examined to show how swimming therapy improves general motor skills, less stressful mental development and social skills. Besides justifying the favourable effects of swimming therapy on body posture and motor development, the other important aim of the thesis is to prove the therapy's usefulness in improving anxiety-free mental development. With the age-related features of the sample, the importance of early recognition is stressed. The thesis presents the latest results of the research which deal with the effects of swimming therapy and complex sport-therapy program, with a special focus on a swimming program applied to increase the health awareness of asthmatic pupils. In the thesis the indices of motor skills, coordination, self concept and mental psychic stability/lability of children with functional spinal disorders, those supplemented with asthmatic symptoms, and their healthy companions not participating in group therapeutic swimming are compared.

State and trait anxiety, test anxiety (total scale, worry & emotionality) and social anxiety (in new situations, in general & fear from negative evaluation), physical self-concept, rhythm skill, spatial orientation, static balance ability and complex skilfulness were tested in children with functional spinal disorders participating in group swimming therapy (Group A), in a swimming based complex sport-therapy group of children with functional spinal disorders supplemented with asthmatic symptoms (Group B) and in to the examination groups matched homogeneous, healthy control group of children selected by calendar age, gender and BMI.

The differences in motor variables were derived with parametric statistical methods. The anxiety scale results of different groups and of different measures of the same groups were analysed with non-parametric tests.

### II.1. Hypotheses

It was supposed that after 18 months therapy attendance the following emotional changes and improvement in motor skills would be observed in the examinations groups:

H<sub>01</sub>: State and trait anxiety do not change significantly.

**H<sub>1</sub>: Both state and trait anxiety significantly decreased as a result of swimming therapy.**

H<sub>02</sub>: None of the test anxiety variables change significantly.

**H<sub>2</sub>: One or two test anxiety variables significantly decreased by the end of swimming therapy.**

H<sub>03</sub>: None of the social anxiety subscales of children are sensitive to group swimming therapy or to complex sport-therapy.

**H<sub>3</sub>: Fear of negative evaluation subscale reflects the anxiety decreasing effect of swimming therapy.**

H<sub>04</sub>: The STAIC-H, TAI-H and SASC-H scores of swimming therapy and control groups do not differ from each other either in examination 1 or examination 2.

**H<sub>4</sub>: Swimming therapy results in a decrease in anxiety for both Groups A and B. The anxiety decreasing effect of complex sport therapy is more expressed.**

H<sub>05</sub>: The results of motor tests and physical self-concept scale were more favourable compared to the control group's.

**H<sub>5</sub>: The rhythm skill, spatial orientation, static balance ability, complex skilfulness and scores of physical self-concept scale are worse than the control group's results in the 1st examination.**

H<sub>06</sub>: No change will occur at the time of the motor tests and in physical self-concept of children as a result of swimming therapy.

**H<sub>6</sub>: The values of motor test and physical self-concept increased compared to their own results in children participating 18 months in swimming therapy program.**

H<sub>07</sub>: The results of the control group in motor tests and scores of physical self-concept scale will be better in examination 2 compared to the control groups.

**H<sub>7</sub>: The results of the therapeutic groups after 18 months will surpass those of the control group in rhythm skill, spatial orientation, static balance ability, complex skilfulness and in physical self-concept scale.**

H<sub>08</sub>: The effect of complex sport-therapy will not be more favourable than that of the swimming therapy.

**H<sub>8</sub>: Swimming therapy results in an improvement in motor abilities in both Group A and B, but the effect of complex sport-therapy on physical self-concept and motor skills is more explicit than that of swimming therapy.**

### III.1. Methods

Calendar age: The time span between the birth of child to the date of measurement according to Mészáros et al. (1990) (CA: 0.01 year accuracy)

Body mass index:  $BMI = \text{weight (kilogram)} / \text{height (m)}^2$

Watershed – Health protective method: children are grouped according to their physical problems as a result of consultations with medical specialists; are taken to the pool and specialists are ensured for the time of their swimming. (group swimming therapy in Vízválasztó Sports Club)

Complex sport-rehabilitation program (Gyene, 1983): The method was specially prepared for asthmatic children. The program starts with a special type of swimming, and then is gradually widened with gym, running, skiing and cycling training sessions. (complex sport-therapy program in Akarat Sports Club)

Motor tests (Farmosi & Gaál, 2007): The method is used to assess motor skills and coordination.

***Rhythm change running***: to assess rhythm skill.

***Boomerang running***: to measure spatial orientation.

***Balance stand on one foot with open eyes***: measures static balance abilities.

***Obstacle course***: to measure complex skilfulness.

Psychometric scales:

**STAIC-H** (State-Trait Anxiety Inventory for Children – Spielberger 1973) Hungarian version (Sipos & Sipos, 1986)

STATE – measuring state anxiety

TRAIT – trait anxiety; measures proneness to feel anxiety

**TAI-H** (Test Anxiety Inventory, Spielberger 1980), Hungarian version (Sipos, Sipos & Spielberger, 1988)

Tot – Test Anxiety total score

W – Worry (in relation to school performance)

E – Emotionality. Anxiety during school exams

**SASC-H** (Social Anxiety Scale for Children, Greca et al., 1988) Hungarian version (Sipos & Rákos, 1991)

SADN – Social anxiety and distress in new situations

FNE – Fear of negative evaluation

SADG – Anxiety and distress in general

**TENNESSEE SELF-CONCEPT SCALE** (short form by Hamza, 1989): measuring the physical self-concept from 12 to 36 points

Methods of data processing: Data were processed by the SPSS for Windows 21.0 statistical program (Kecskeméty & Izsó, 1996). The times of the motor tests were considered continuous (parametric), while the scores of psychological tests were considered as interval variables (non-parametric) during the data process analysis.

- Basic statistics: mean ( $M/\bar{x}$ ), standard deviation ( $SD/s$ ), variable coefficient ( $v$ ), and minimum-maximum values were calculated. T-tests were applied to detect the statistically significant mean differences, in case of non-significant F-test result.
- One-tailed t-test was used to compare the results of therapeutic swimming (control) groups executed at two different times.
- Two-tailed t-test was used to compare the therapeutic and control groups.
- Variation analysis was used to examine the simultaneous differences in the results of Group A, B and control group.
- The Mann-Whitney test (tested group and control group) and the Wilcoxon test (Test 1 and 2 of the same group) was applied in the non-parametric variables.
- The factor–structure of variables was determined for both the tested and the control group with factor analysis. The differences were considered significant with a 5% probability. The same probability was used in determining the divergence of correlation coefficient from 0.

### III.2. Sample

In Hungary, four to five thousand children under 18 year-old attend swimming therapy programs supplemented with the teaching of special swimming techniques and supported by the National Health Insurance Fund (OEP). In the 4<sup>th</sup> district this number is 300-400 children. The first aim of sampling was to create subgroups of homogeneous sample based on gender, age, health condition, and level of swimming skill and the effects of school (e.g., PE lessons, school requirements, school expectations, and the personality of teacher).

The pupils of Classes 1-4 of the Bajza József Primary School in the 4<sup>th</sup> district of Budapest (N=221) were selected for the program as they had functional spinal problems without bone structure deformation (N=26).

Classmates of pupils in the therapeutic swimming were also involved, so it became possible to create a sub-sample of the control group, matching their gender, calendar age and body mass index. So those participating in therapeutic swimming and showing spinal disorders sometimes supplemented with asthmatic symptoms (N=15) could be surveyed together with the control groups in the oldest and most colourful club which, besides swimming, offered other sport activities as well, such as running, gymnastics, cycling and skiing (“Akarat Sports Club”).

Pupils were divided as follows:

**Group A (N=26)** (STH group): swimming therapy group (in Vízválasztó Sports Club)

- 8.5-11 year-old boys with functional spinal disorders (N=11)
- 8.5-11 year-old girls with functional spinal disorders (N=15)

**Group B (N=15)** (complex sport-therapy group): therapeutic swimming-based complex sport therapy group (in Akarat Sports Club)

- 8.5-11 year-old boys with functional spinal disorders and mild/moderate asthmatic symptoms (N=8)
- 8.5-11 year-old girls with functional spinal disorders and mild/moderate asthmatic symptoms (N=7)

**Group C (N=41)**: Control group formed by pupils from the same school environment with the same pedagogical effects, matched to Groups A and B based on gender, decimal age and body mass index:

- 8.5-11 year-old non-therapeutic swimmer boys (N=19)
- 8.5-11 year-old non-therapeutic swimmer girls (N=22)

## IV. RESULTS

### IV.1 Changes in the results of the anxiety scales

According to the Wilcoxon test, a significant decrease occurred in the results of the anxiety scale after 1.5 years therapeutic programs.

- In *Group A* trait anxiety (STAI-C-H), test anxiety – worry, emotionality and test anxiety total scale (TAI-H), and fear of negative evaluation (SASC-H) decreased significantly. Values of state anxiety, social anxiety and distress – in “new situations”, and “in general” – remained unchanged.
- In *Group B* all anxiety scale scores showed a significant decrease ( from 1st examination to Test 2).
- No change could be observed in the results of anxiety scales of the *Control group* in either of the tests.

The results of the Mann-Whitney test showed that the identical scores of anxiety test justified the following:

- Anxiety scores of *Group A*, *Group B* and matched *Control group* showed no statistically significant differences in the 1st examination.
- No significant differences could be found in the anxiety scores of *Group A* and *Control group* in the 2nd examination.
- All anxiety scores of *Group B* and *Control group* showed a significant difference ( $p < 0.038 - 0.0001$ ) in the 2nd examination.

### IV.2 Changes in the results of motor skills and physical self-concept

- Rhythm skill, complex skilfulness, static balance ability and spatial orientation improved significantly in *Group A* in the 2nd examination. No change could be statistically proven in physical self-concept scale.
- *Group B*, in all motor tests and in physical self-concept scale, showed better results at a very strong level of significance in the 2nd examination, surpassing their previous results. Complex skilfulness, static balance ability, rhythm skill and spatial orientation visibly improved and their self-concept became better, as well.
- *Group A* and the matched *Control group* differed statistically only in rhythm change running, referring to their rhythm skill, in Test 1. The examination group performed worse. There was no difference observed in the results of other variables. The results of the 2nd examination showed that therapeutic swimmers with functional spinal disorders caught up with the control group in rhythm skill. The difference which existed in the 1st examination disappeared. There's no differences in the other motor skills compared to the matched control group, so they did not differ from the healthy children in this respect.
- For *Group B* and matched *Control group*, the time spent on covering the obstacle course showed a difference in the 1st examination. Members of Group B completed the test slower than those in the control group. No difference was found in the other results: in rhythm change running, static balance, boomerang running and physical self-concept scale. But the complex sport-therapy group not only caught up with the

control, but showed significantly better results in both obstacle course and physical self-concept in the 2nd examination than the control group. No differences could be found in the other variables.

- *The total therapeutic sample*, performed similarly to the complex sport-therapy group in surpassing the results of the control group in the 2nd examination. In the 1st examination they had significantly worse results in rhythm change running, but in the 2nd measurement they made up for the lag and completed the obstacle course faster, and the scores of physical self-concept scale became better than the control group's.
- No difference could be found in the *total therapeutic swimming group* between *the boys* and *the girls* in relation to motor skills and physical self-concept neither in the 1st nor in the 2nd examination. On the other hand, in the control group the boys completed the rhythm change running in the 1st and the obstacle course in the 2nd measurement much faster than the girls. No significantly better results were reached in the 2nd examination by either the boys or girls in physical self-concept's point in the total therapy group.

## V. CONCLUSIONS

Both the state and trait anxiety decreased only in Group B, so the **1st hypothesis** can be proven partially

**The 2nd hypothesis** can be proven without limitations as all sub-scale values of test anxiety showed a statistically significant decrease in the 2nd examination for Group A. Group B, in the total scores of test anxiety scale and in the worry and in emotionality sub-scales, had significantly better results than the control group.

Social anxiety – fear of negative evaluation in the sub-scale can be characterized with a lower level of anxiety in both therapeutic swimming groups than in the control group. Group B showed lower values in all indices of social anxiety than the healthy control.

**The 3rd hypothesis** was totally proven.

**The 4th hypothesis** was totally proven. In 5 from the 8 anxiety scales (trait anxiety, test anxiety total scale – worry, emotionality and social anxiety – fear of negative evaluation sub-scale) a decrease could be observed in Group A and in all scales of anxiety in Group B.

**The 5th hypothesis** could be only partially proven. In the examination before the start of the therapeutic swimming program, supposedly as a result of a poorer participation in physical activity, children with functional spinal disorders and asthmatic symptoms had lower scores in the motor tests than the control group (Group A: rhythm change running; Group B: obstacle course; total therapeutic group: rhythm change running). The results of anxiety scales and physical self-concept did not differ in 1st measurement between the examination groups and the control groups.

**The 6th hypothesis** could be proven only partially as children in Group A their previous results only surpassed in rhythm change running, obstacle course, static balance on one foot and boomerang running. Those in Group B surpassed their previous results in all variables in the 2nd examination.



**The 7th hypothesis** could be proven partially, but **hypothesis 8** was proven completely. The therapeutic swimmers with spinal disorders (Group A) did not differ from their control group in the 2nd examination. Group A could make up for the lag in running-related motor tests compared to the control group, while the results of the total therapeutic sample and Group B in the obstacle course and in the physical self-concept scale's results surpassed the results of the control group. The mean values of the participants are influenced by the difference in gender and the type of swimming therapy. The mean values change in fewer variables in the total sample and the changes appear in different indices, than they do in the swimming therapy group.

As the physically active lifestyle in all age groups is the cornerstone of primary and secondary prevention of such chronic disorders as asthma and many orthopedic problems. It is not surprising that Istvan Gyene is the first winner of the "Kopp – Skrabski Prize" (2013) [award for extraordinary role playing person in health education]. The decision of medical and social worker EDUVITAL jury mirrors the nationwide successful application of the highly effective "complex sport-therapy" worked out by Gyene (1991).

In studying the results of the two examinations, it can be stated that the on swimming therapy based complex sport-therapy significantly improved in all indices compared to its previous results, and in 10 out of the 13 studied variables it even surpassed the control group. The swimming therapy group reached "only" the level of the control group. As far as the psychological effects are concerned, the greatest difference occurred between the above mentioned two methods: the 18-month long regular participation in the complex sport-therapy program resulted in a statistically significant decrease in anxiety and the enhanced development of complex motor skills, and favorably influenced the appreciation of physical self-concept.

Based on the validity of STAIC-H, TAI-H and SASC-H together with the reliability group results of the total sample, it can be stated that complex sport-therapy program combined with swimming therapy has a general emotional regulating effect, but – based on the present research – the swimming therapy alone, does not. The basis of primary and secondary prevention at all ages is a physically active lifestyle, for such diseases as asthma and different orthopaedic problems.

In our research a significant improvement could be shown in the results regarding anxiety, motor tests and scores of self-concept scale more in the complex sport therapy group compared to the swimming therapy group.

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