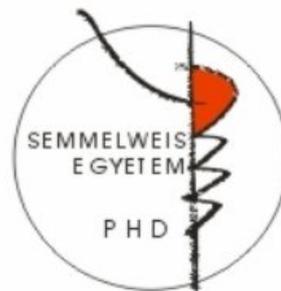


# Effect of regular physical activity on the fitness and quality of life of asthmatic children

**Ph.D. Thesis**

**Kinga Balla (born Belányi)**

Semmelweis University  
Doctoral School of Public Health and Health Science



Supervisor: Györgyi Mezei, M.D., C.Sc.

Official reviewers: Ferenc Harangi, M.D., C.Sc.  
György Purebl, M.D., Ph.D.

Head of Comprehensive Exam Committee: Gábor Pavlik, M.D., Ph.D., D.Sc.

Members of Comprehensive Exam Committee: János Hamar, M.D., Ph.D.  
Adrienn Stauder, M.D., Ph.D.

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## INTRODUCTION

Herodicus, teacher of Hippocrates, recommended physical activity and regular training as treatment for his patients as early as 500 B.C. However, common medicine initially showed serious interests regarding the possible positive effects of physical activity on chronic diseases (like bronchial asthma, coronary disease, etc.) only at the beginning of 1930s. The first international reference recommending physical activity as associated treatment for bronchial asthma was published in 1935 by Schutz, in Germany. The first Hungarian paper on this topic appeared in 1960, and the author Barna Andrásófszky, recommended swimming training as complementary element in the treatment of pediatric bronchial asthma.

Nowadays, physical activity is an integral part of the long-term asthma treatment. Still, symptoms often hinder the young asthmatics in participating in physical activity. To keep a patient free from symptoms requires that the medicine, subscribed by the physicians, to be regularly taken, and that the right form of training to be selected.

Running is the least recommended form of training for asthmatics, because it easily provokes exercise induced asthma. In contrast, swimming training is well acknowledged as by far the best exercise, because it precipitates asthma less than land-based activities. Previous studies support that due to regular swimming training the swimming-fitness of the asthmatic children and adolescents reached a higher level. The question is, whether swimming training, as the least asthmogenic physical activity form for asthmatics, can positively influence the running-fitness too. In the same time, the comparison of the fitness level between asthmatic children and their healthy peers needs more examination. Some authors did not find any difference in the fitness level of asthmatics and healthy children, while other researchers claim that asthmatics have lower fitness level.

It is becoming more often that asthmatic children say no to physical activity, despite the fact that they are well treated and have no symptoms. With the hypokinetic lifestyle appears the problem of obesity. Supposedly, there is a connection between asthma and obesity. The almost simultaneous increasing prevalence in asthma and obesity can be assumed as an evidence of this connection.

The effect of physical activity on the quality of life of asthmatic children is controversial, similarly to the connection between the quality of life and psychological status of the asthmatics and their caregivers.

The possibility to analyze these controversies and to form a personal point of view on these topics provided the motivation for this examination.

## **AIMS**

The aim of the examination was to compare the physical fitness and quality of life of the asthmatics who took part in regular therapeutic swimming training program, with that of the non swimmer asthmatic and healthy children.

Main questions:

1. Is there a difference in the running fitness between swimmer asthmatics, non swimmer healthy, non-swimmer asthmatic children and swimmer young subjects with orthopedic disorders?
2. Has the running fitness of swimmer asthmatics and non swimmer healthy children changed in the last two decades?
3. Is the obesity rate in the asthmatic group higher than in the healthy children group?
4. Does the regular swimming training have an effect on the asthmatics quality of life and psychological status in comparison to non swimmer asthmatics?
5. Is there a difference between the quality of life and psychological status of the caregivers of swimmer and non swimmer asthmatics?
6. Is there an interaction between the quality of life and psychological status of the swimmer asthmatics and that of their caregivers?

## **SUBJECTS AND METHODS**

The examined group consisted of asthmatics treated in different medical institutions, who took part in the regular swimming training program by the Akarat Diák

Sportegyesület (N=298). Three control groups were chosen. From the Outpatient Clinic of the First Department of Pediatrics, Semmelweis University, 100 non-swimmer children were enrolled, based of their age and asthma severity. Another control group included healthy subjects from different schools and a college from Budapest (N=456). Healthy subjects developed their fitness at the physical education classes in schools. The third control group was the group of regular swimmer subjects with orthopedic disorders, who took part in the same swimming training program by the Akarat Diák Sportegyesület (N=236).

In the trend analysis from 1985 to 2004 we compared children taking part in the same therapeutic swimming program. In the article of Szentágothai (Pediatric Pulmonology, 1987, 3: 166-172) participated 40 swimmer asthmatic and 41 non-swimmer healthy boys. Their fitness results were compared with that of 26 swimmer asthmatic boys' and 54 non-swimmer healthy boys' from 2004.

In 2004, severity of asthma was determined according to the GINA (2002) classification (intermittent asthma, mild persistent, moderate persistent and severe persistent asthma). The parents of the swimmer children from 2004 formed the caregivers group in the analysis of the quality of life and the psychological status.

## **Methods**

Swimmer asthmatics took part in the Gyene swimming training program. The measurement of running fitness is an integral part of the traditional swimming method. Cooper test is widely accepted as a method for assessing the long distance fitness. Participants run for 12 minutes, and the total distance covered is recorded. The outcome is based on age and gender of the test person. Cooper test is also performed in schools in educational classes.

To determine obesity, in a first step, body mass index was calculated and than BMI values were transformed in percentile values.

For the analysis of quality of life and psychological status, subjects were ask to fill out the Hungarian validated version of the following questionnaires: Pediatric Asthma Quality of Life Questionnaire (PAQLQ), Pediatric Asthma Caregivers Quality of Life Questionnaire (PACQLQ), Hungarian State Trait Anxiety Inventory for Children (H.STAIC), Hungarian State Trait Anxiety Inventory (H.STAI), Child Depression

Inventory (CDI), Beck Depression Inventory (BDI) and the short form of stress questionnaire.

Parametric data were analyzed with Chi<sup>2</sup> and Fisher's exact tests. Non-parametric data from quality of life and psychological status measurements were compared using Mann-Whitney and Kruskal-Wallis tests. By correlation analysis Spearman and Wilcoxon Rank tests were used.

## **RESULTS**

1. Running fitness of swimmer asthmatics is significantly better than that of non-swimmer asthmatics ( $p=0.01$ ) and healthy persons ( $p<0.0001$  Chi<sup>2</sup> test). Between swimmer asthmatics and swimmer subjects with orthopedic disorders no significant difference was found regarding running fitness ( $p=0.29$ ).

2. The fitness outcomes of all boys from 1985 (asthmatics + healthy) is significantly better than the outcomes obtained in 2004 ( $p<0.0001$ ). The asthmatics as well as the healthy subjects from 1985 performed better than their peers from 2004 ( $p=0.0003$  and  $p<0.0001$ , respectively). Neither in 1985, nor in 2004 was significant difference found between the running fitness outcomes of asthmatics and healthy subjects.

3. In the swimmer group (asthmatics + subjects with orthopedic disorders) the number of overweight and obese children was significantly lower than in the non-swimmer group (asthmatics + healthy subjects,  $p=0.03$ ). In the group of swimmer children with orthopedic disorders the rate of overweight and obesity was significantly lower than in the group of non-swimmer asthmatic and healthy subjects ( $p=0.033$ , and  $p=0.03$ , respectively).

4. There was no significant difference regarding quality of life and psychological status between the group of swimmer and non swimmer asthmatics.

5. Caregivers of swimmer asthmatics had significantly higher quality of life level in comparison to caregivers of non-swimmer asthmatics ( $p=0.044$ ).

6. Caregivers with asthmatic children having higher quality of life level, have themselves better quality of life than caregivers, whose asthmatic child has a lower quality of life level ( $p=0.012$  Mann-Whitney test). The other way around, asthmatic children whose caregivers have higher quality of life level, have themselves better quality of life than their peers, whose caregivers' quality of life level is lower ( $p=0.011$  Mann-Whitney test).

In the group of caregivers of asthmatic children, the stress level is significantly higher by caregivers, whose child show more anxiety or depression symptoms in comparison to caregivers, whose child have fewer anxiety or depression symptoms ( $p=0.0072$  and  $p=0,0002$ , respectively,  $\text{Chi}^2$  test).

The number of depression symptoms of asthmatic children, whose caregivers had higher stress level, was significantly higher in comparison to their peers, whose caregivers have lower stress level ( $p=0.011$ ).

By comparing the interaction between quality of life and psychological status of children and their caregivers no other significant difference was found.

## CONCLUSIONS

The results of our comparisons allow the conclusion that with regular swimming training, and accordingly with the complex program based on this swimming training, the fitness of asthmatics can be as high or even higher as the fitness of their healthy peers.

It is proved that by asthmatics, running fitness may be improved with swimming training. One of the basic requirements is that asthma symptoms must be reduced with appropriate medical treatment. In the national and international database we did not found any previous article, which described the benefits of swimming training based on the measured running fitness level in asthmatics and healthy children.

Our trend comparison showed that the fitness of healthy and asthmatic children worsened between 1985 and 2004.

We did not find any difference between the asthmatics and healthy subjects regarding obesity rate. Our results suggest that regular swimming may have a beneficial effect on the BMI. In the combined group of swimmer children (asthmatics and orthopedic group) the rate of obesity was significantly lower than in the combined group of non-swimmer young subjects (asthmatics and healthy). Yet, further investigations are needed to prove the positive effect of the regular swimming training regarding obesity. Based on the questionnaires it turned out that the swimming training has no effect on the quality of life and psychological status of the swimmer asthmatics if compared to their non swimmer peers.

Our findings are in apparent contrast to the international data, the latter suggesting that regular physical training increases the quality of life. However, the mismatch is caused by the already high quality of life level of the non-swimmer asthmatics involved in our study (plato effect). On the other hand, our examination was a cross sectional study, until most other investigations, claiming an increase of the quality of life, were longitudinal studies, in which the effects of physical activity were measured in self-controlled groups.

Caregivers of swimmer asthmatics show significantly higher quality of life level, than caregivers of non swimmer asthmatics, but regarding psychological status there is no difference between the two caregivers group. To our knowledge, this is the first study analyzing the quality of life and psychological status between caregivers of trained and untrained asthmatic children.

The interaction between quality of life and psychological status of asthmatics and their caregivers is also controversial. Our results show that the asthmatics' high quality of life strongly correlates with the high quality of life of their caregivers, and inversely. These findings are supported through international data.

Based on our findings in the swimmer asthmatics group, swimming based fitness development may be also a good alternative for healthy children against the hypokinetic lifestyle. The secular trend of worsened fitness level needs more investigation and, from the public health point of view, needs rush intervention.

## **PERSONAL PUBLICATION RECORD (Balla Kinga, born Belányi)**

### 1. Scientific articles on the topic of the thesis (English):

- Balla K, Szabó A, Gyene I, Jáky Z, and Mezei G. (2008) Does long term regular swimming have an influence on quality of life, anxiety and depressive symptoms of adolescents with asthma? *Hungarian Medical Journal*, 4: 551-561.
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