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E – 32

The Role of Physical Activity and Sport in Health Development

Evaluation of Recreational Training Programs on Followed Samples, with Special Emphasis on the Sense of Coherence from a Salutogenic Perspective

Doctoral (PhD) Dissertation Theses

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1. Introduction

My choice of topic was motivated by the fact that I have been working as a fitness and bodybuilding instructor for about 20 years in the field of health promotion, mainly using physical recreation.

I also wanted to strengthen my practical experience by applying scientific research methods, which is why I chose to study the effects of physical recreation under controlled conditions on health, with the intention of changing behaviour to improve it. Among other things, I plan to use these research results in the field of personal training.

The health of the Hungarian population, the mortality rate due to physical inactivity and diet-related diseases, the proportion of overweight and obese people, and the need to take action against this, are all indicators of the topicality of the issue. One way of doing this is to further develop personalised recreational training in a way that increases the effectiveness of training programmes. This could prevent related diseases, reduce health expenditure (László Zopcsák, 2013) and increase people's demand for health promotion.

In choosing the locations for my research, I sought to ensure that the collaborative work is internationally relevant. Thus, the first phase was conducted with Hungarian clients, men and women, between March 2008 and March 2010. In the second phase, I used the experience of research with a Hungarian sample to launch a follow-up study on Austrian women between September 2019 and February 2020.

While planning the research, we had no idea how challenging it would be to continue recreational training online without the presence of a personal trainer (Katalin Bíróné Ilics, Mário Lévai and Katalin Nagyváradi, 2022) during the pandemic (László Zopcsák, 2020). Despite the difficulties, we continued the research and the third phase of the research took place between March 2020 and May 2020.

The training programmes in Hungary and Austria were basically the same. However, due to the pandemic, certain elements of the training programme had to be adapted to this new situation, which also meant modifying the research tools.

Phase 3 of the research was conducted on this sample, so the movement content of the online training programmes was slightly modified.

I have developed the programme used into a specific training programme, with the addition of heart rate controlled exercise as an element. The heart rate is kept in the fat burning zone between 135-155 min/sec. using a POLAR FT7 heart rate monitor (HR max), i.e. between 65-75% of the maximum heart rate (HR max) (Edit Dömötör, 2005) (https://support.polar.com/e_manuals/FT7/Polar_FT7_user_manual_Magyar/ch06.html).

One indicator of progress is the average heart rate, which decreases during exercise for the same workload.

Based on the literature, we followed the fundamentals of recreational training (Fritz, P. 2006) according to the fitness training methodology, the most important characteristics of which are (Kovács, Szollás, 2008):

- body and body shaping,
- weight loss,
- building targeted muscle groups,
- aesthetics aspect,

tools:

- spinning,
- conditioning machines,
- dumbbells,
- elastic bands,
- fitball.

Another added special element is that the warm-up was done on a spinning bike.

A third special feature is that the following muscle groups have been shaped to suit the needs of the guests: abdomen, femoris, iliacus and gluteus, as these are the areas where excess weight is deposited in men and in women as well. The initials of the Latin names of the muscles are combined to form the acronym AFIG, which is the name of the specific training.

Fourthly, during the stretches, we combined Iyengar yoga elements with the execution of the tasks, also adapted to the needs of our guests.

The online training programme allowed the client to choose the online space where they could join the training, whether indoors or outdoors, in their home garden or apartment, from their phone or laptop.

Checking the correct technique of conducting recreational training in the online space is extremely difficult, while this was not a problem with face-to-face control. The chance of injuries is higher, I could control my clients less.

During the training, the clients used their own or borrowed equipment (rubber bands, hand weights), which also modified the movement material.

2. Objectives and hypotheses

Research objectives:

The aim of my research was to investigate, using exact methods, whether the recreational participants' wellness, salutogenetic coherence, self-assessed health, vegetative instability, health orientation, and sleep quality change during the 3rd phase of the research.

How long an "exposure" period do they need to attend the training in order to be able to statistically detect its effect on the (dependent) variables under study.

What factors influence the effects attributable to training.

Along these objectives, the following hypotheses were formulated:

H1: The majority of the participants' health status (self-assessed) is changing in a positive direction.

H2: The number of symptoms suggestive of vegetative instability decreases.

H3: Their wellness status, as measured by their OLP total score, will improve.

H4: According to the trans-theoretical model, their health orientation will be strengthened.

H5: Participants' sense of coherence will be strengthened during the training.

H6: The effect of the training can only be statistically demonstrated after a longer period (2-3 months of regular training).

H7: The sense of coherence is mainly related to the emotional, mental and physical dimensions.

3. Research methods (variables and their "measurement tools")

The examined dependent variables are:

- the Optimal Life Profile (OLP) questionnaire, which covers the dimensions of environmental, mental, spiritual and physical health,
- the 13-item Salutogenetic Coherence Scale or SOC-13, whose dimensions include: comprehensibility, manageability and the sense of meaningfulness,
- the 4-grade Likert scale for self-evaluation of general health, the vegetative instability test, health orientation based on the trans-theoretical model,
- sleep quality in terms of the Regensburger insomnia scale.

Control variables are:

- marital status,
- work,
- living conditions.

And independent variables are:

- gender
- age,
- the duration of the training programme,
- frequency of participation in training,
- the duration per session.

4. Sample selection and methodology in phase 1 of the research - March 2008 - March 2010

The participants in the study were selected from among those who met the selection criteria, i.e. who were not taking part in any other physical recreational sport activity, who agreed to participate in the training sessions twice a week for two years (with a break of no more than a few weeks) and who agreed to complete the questionnaires.

The training programmes were implemented with the help of 7 personal trainers, who were regularly consulted in order to minimise subjective factors influencing the planning and implementation of the training.

We focused on the following methods: developing aerobic capacity, personalised performance enhancement, optimal energy use and input, optimal load capacity during trainings, and developing lifestyle modification techniques. The training locations were provided by 3 fitness gyms in Szombathely: Galaxy Fitness Club, Lady Fitness Studio and the Öntöde Sportcentrum.

The dates of data collection are shown in Table 1:

Survey Time			Collected Data, Tests	
Year	Month			
2008	03.		Complete data collection	
	04.			
	05.			
2008	06.		Self-assessment of health status, VELA, SOC	
	07.			
	08.			
	09.			
	10.			
	11.			
2008	12.		Self-assessment of health status, VELA, SOC	
	01.			
	02.			
2009	03.		Self-assessment of health status, VELA, SOC, OLP	
	04.			
	05.			
	06.			
	07.			
	08.			
	09.			
	10.			
	11.			
	12.			
	01.			
	02.			
2010	03.		Complete data collection	

Table 1 Data collection dates

In addition to socio-demographic data (such as gender, age, education, marital status, lifestyle), three questionnaires used in international research and validated on Hungarian samples were completed at the beginning and end of the programme: the Hennenhofer-Heil vegetative instability self-test (VELA questionnaire) (Hennenhofer-Heil, 1975), the Optimal Life Profile (OLP) questionnaire, the Antonovsky sense of coherence (SOC - scale) (Antonovsky, 1979), and the health self-assessment scale asking about current health status.

5. Sample selection and methodology in phases 2 and 3 of the survey (among women)

Originally planned for 1 year, the original programme was discontinued after 6 months due to curfew and restrictions during the pandemic.

The training sessions were conducted online with the majority of the participants, reducing the number of participants to 53. The target population of the study was selected from the provinces of Burgenland (Rohonc, Schachendorf, Großpetersdorf, Schandorf, Dürnbach, Hannesdorf, Burg, location: Schachendorf, personal training centre).

For comparability, I present the results of phase 2 of my research on this sample (Figure 1).

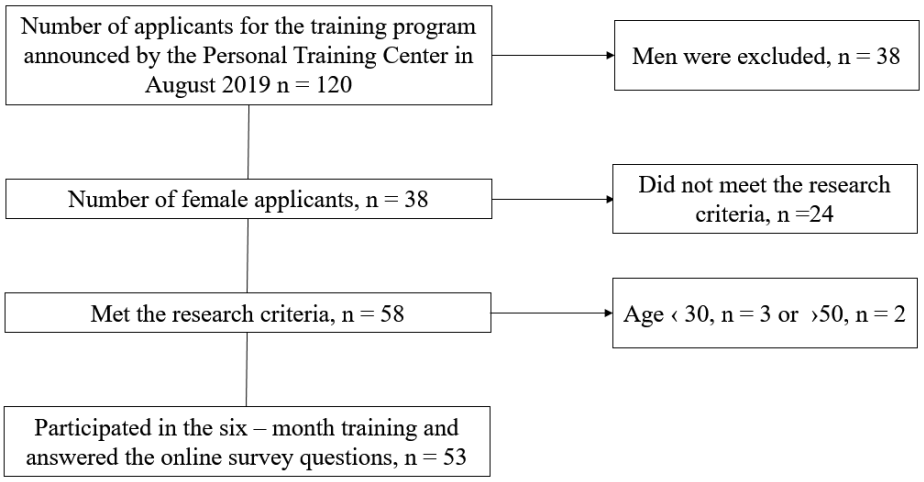

Figure 1 Flow diagram of the sample selection process

We also recorded physical parameters and completed client questionnaires 5 times, thus the dependent variables in Phase 2 of the research were: fitness parameters, Regensburger sleep quality test (Crönlein, Langguth, et al 2013), the SOC - validated German version of the Health Self-assessment Questionnaire (Antonovsky, 1979). In Phase 3 of the study: the Regensburger Sleep Quality Test, thevalidated German version of the SOC - and the Health Self-Evaluation Test (Hennenhofer-Heil, 1975) were completed.

Methods of statistical analysis:

In all three phases of the study, continuous or nearly-continuous variables were described by the mean and standard deviation, or (if a normal distribution was not assumed) by the median and interquartile range.

Qualitative variables are presented through frequencies and relative frequencies. Chi-square tests, Wilcoxon or Mann-Whitney tests were used for correlation examination, and a correlation analysis was carried out.

For the multivariate analysis, we used a multiple linear or logistic regression model, depending on whether the outcome variable was considered to be normally distributed. The factor structure of the dependent variables was determined by factor analysis (Extraction Method: Principal Component Analysis, Rotation Method: Varimax with Kaiser Normalization). The General Linear Model (GLM) model for Repeated Measures was also used to examine the change in coherence perception and vegetative instability over a two-year period. Data were recorded in the spreadsheet program Excel and transformed into an SPSS database. SPSS vs.18 software was used before 2010, and SPSS vs.28 after 2020 (https://www.ibm.com/spss).

Ethical aspects of the research:

The study protocol complied with the latest version of the Declaration of Helsinki. Participation in the study was anonymous and voluntary. The Regional Research Ethics Committee of the Clinical Centre of the University of Pécs approved the conduct of the studies (approval numbers: 7520-PTE 2018, 7520-PTE 2020).

6. Discussion

Results of phase 1 of the research:

Compared to the start of the training, the proportion of people who rated their health as positive increased significantly for both men and women ($p=0.028$ for men and $p<0.001$ for women according to the Mc Nemar test) (Figure 2).

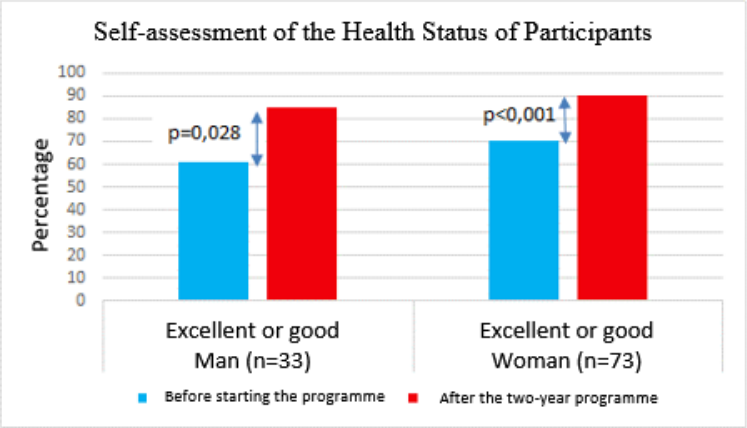

Figure 2 Participants' self-assessment of health

Among men, the average OLP after one year is not significantly different from the starting value (p=0.356), but after two years there is an increase (p=0.049), i.e. a positive change in the "life profile" of the participants. In the sample of women, the increase in OLP score was on average highly significant after one year (p=0.001) and further improved (p<0.001) at the end of the following year (Figure 3).

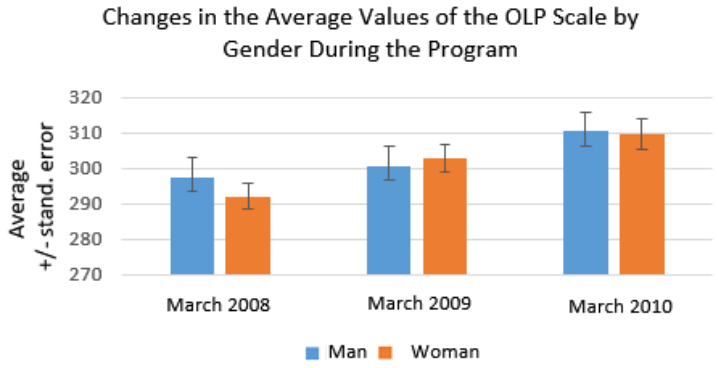

Figure 3 Changes in OLP scale mean scores by gender over the course of the programme

In the male sample there was no detectable (significant) change in the "degree" of vegetative instability, based on the mean score of the VELA index. However, there was a significant reduction in the number of symptoms of vegetative instability among women. Women's levels of vegetative instability were particularly high before the start of the programme, but they were higher than men's throughout (Figure 4).

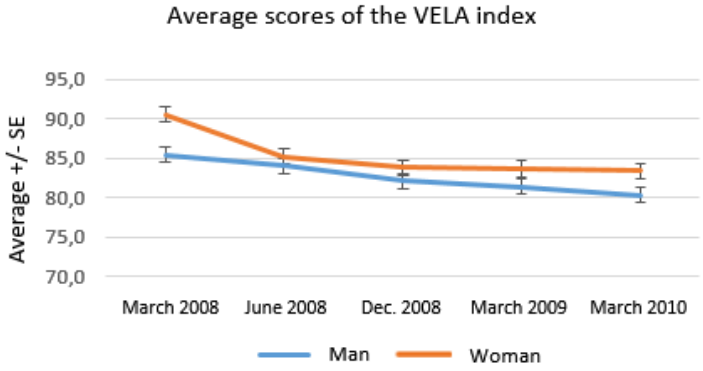

Figure 4 Mean scores of the VELA index and standard error of the means by measurement

Based on the test results obtained with the GLM model, men's sense of coherence was always stronger than women's. However, women's sense of coherence increased more significantly than men's, and by the end of the programme the difference between men's and women's sense of coherence had disappeared (Figure 5).

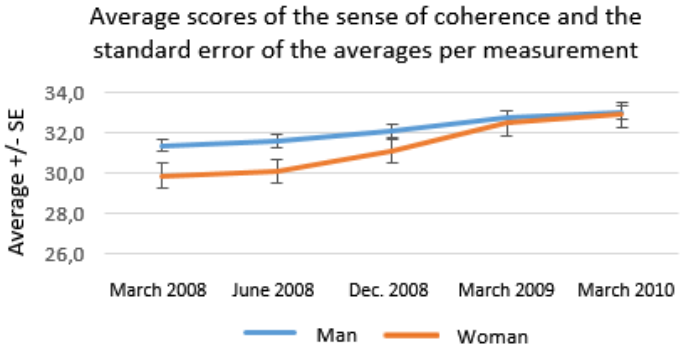

Figure 5 Mean coherence scores and standard error of the means by measurement

Results of logistic regression analysis in phase 1 of the research:

People over 40 are significantly, albeit slightly, more likely to improve their social health compared to those younger than them. The improvement in physical and social health was not influenced by gender, but the odds of a positive change in women's mental health were about 4-5 times higher than for men. Regular attendance at training is the most significant, especially for physical and social health. Those who regularly attended training sessions throughout the two years were several times more likely to improve their physical and social health than those who occasionally did not attend (Table 2). (Regular attenders were defined as those who did not miss training sessions for more than 3-4 weeks over the two years and attended at least weekly.)

Predictor variables		Odds Ratio and 95% Confidence Interval		
		Physical Health	**Mental Health**	**Social Health**
Age (years)	>40 (1) vs. <= 40 (0)	not significant	not significant	1,2 (1,1-1,4)*
Gender	Female (1) vs. Male (0)	not significant	4,3 (1,1-16,4)*	not significant
Regular attendance at training	Yes (1) vs. No (0)	10,8 (2,5-48,3)**	4,1 (1,1-15,4)*	10,7 (2,1-16,4)**
Average minutes spent	>= 60 (1) vs. < 60 (0)	9,4 (2,2-40,0)**	not significant	4,2 (1,1-16,4)*

* p < 0,05; ** p < 0,01

Table 2 Results of logistic regression models of factors influencing physical, mental and social health in the first phase of research

Factor analysis of changes in phase 1 of the research:

Changes in the sense of coherence together with changes in emotional, physical and mental health form a hypothetical variable in which emotional health and sense of coherence are the most important variables. At the same time, self-assessed health (weighted by symptoms of vegetative instability) forms a factor with the change in the social health dimension. This suggests that the effect of training on health improvement is closely related to improvements in social health (Table 3).

	Components		
	1	2	3
Change in emotional health	0,891		
Change in sense of coherence	0,816		
Change in physical health	0,579		
Change in mental health	0,549		
Change in intellectual health		0,884	
Change in environmental health		0,865	
Health status *VELA change			0,845
Change in social health			0,725

Table 3 Factor structure of health status self-assessment-weighted VELA index, OLP dimensions and change in sense of coherence

Physical parameters in phase 2 of the research:

Shows changes in fitness status, i.e. changes in participants' fitness parameters from the start of the programme to the end of month 6. Wilcoxon rank tests indicate significant improvements in all parameters (Table 4).

PARAMÉTER	**Survey Time Point**	**Overall (n=53)**		Wilcoxon Rank Test Significance Level
		Mean	Standard Deviation	Before vs. 6 months after
Squats (reps/min)	0. Before the start of the training	24.9	7.4	0.022
	6 months after	26.5	6.9	
Push-ups (reps/min)	0. Before the start of the training	16.6	7.7	0.028
	6 months after	17.5	7.4	
Sit-ups (reps/min)	0. Before the start of the training	18.2	7.3	0.033
	6 months after	19.9	6.0	
Stretching (cm)	0. Before the start of the training	88.6	9.5	0.002
	6 months after	89.1	10.1	

Table 4 Fitness parameters in the second phase of the study after 0 and 6 months

Sense of coherence and sleep quality in phase 2 of the study:

Table 5 illustrates the evolution of the three dimensions of the sense of coherence and the overall score on the insomnia scale. As can be seen, a similar phenomenon is observed in the change in SOC during the implementation of the training programme as was observed in the change in physical parameters. It can be seen that the change is not statistically significant at three months, but is statistically significant after six months. However, sleep problems were significantly reduced after three weeks.

PARAMETER:	Date of Survey:	Total: n=53		Friedman Test (pair-wise comparisons)		
		Mean	Std.	0.-3.	3.-6.	0.-6.
Comprehensibility:	Before starting the training:	9.3	3.1	0.143		0.048
	After 3 months:	9.8	2.6		0.142	
	After 6 months:	10.5	3.0			
Manageability:	Before starting the training:	8.7	2.5	0.174		0.003
	After 3 months:	9.1	2.3		0.099	
	After 6 months:	10.1	3.1			
Meaningfulness:	Before starting the training:	11.3	2.0	0.145		0.029
	After 3 months:	11.8	2.2		0.466	
	After 6 months:	12.1	2.3			
Sense of Coherence (SOC):	Before starting the training:	29.3	5.8	0.356		0.005
	After 3 months:	30.6	5.5		0.076	
	After 6 months:	32.7	7.6			
Regensburger Insomnia Scale:	Before starting the training:	16.1	3.1	< 0.001		< 0.001
	After 3 months:	13.8	2.9		< 0.001	
	After 6 months:	9.1	2.1			

Table 5 Means and standard deviations of the Regensburger scale scores and the coherence perception scores before, three and six months after starting the training and the significance levels of the Friedman test in the second phase of the research

Relationships between the sense of coherence and quality of sleep in research phases 2 and 3:

Our article published in 2020 (International Journal of Environmental Research and Public Health, 2020) illustrates in Figure 6 that after 6 months of training, there is a significant correlation between the sense of coherence and sleep quality (arrows 1 and 2).

After 6 months of training, there is a positive change in the parameters of sleep quality and sense of coherence. SOC was enhanced and sleep quality improved (arrows 4 and 5).

Sleep quality deteriorated during the pandemic (arrow 6).

Those with a relatively strong sense of coherence continued training during the pandemic (arrow 8).

A sense of coherence also has a significant positive effect on sleep quality during the pandemic directly (arrow 10) through physical activity (arrows 8 and 9) (Figure 6).

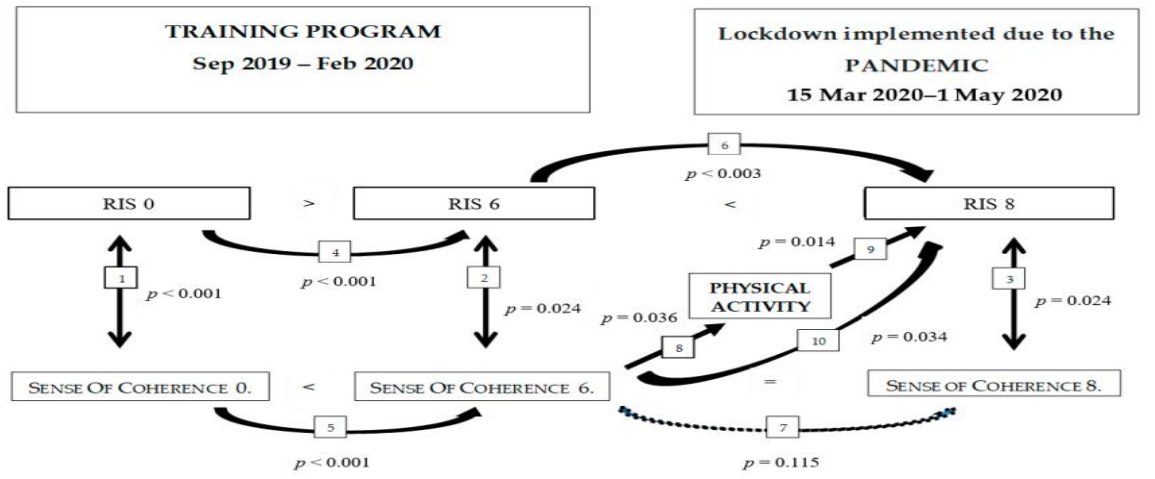

Figure 6 Graph illustrating the relationship between physical activity-sense of coherence -quality of sleep in research 2 and 3

7. New scientific results

My research confirms my hypotheses that

- the health of the majority of participants (self-assessed) changed in a positive direction.
- perception of coherence at programme entry influences the perceived effects on the dependent variables tested.
- their symptoms of vegetative instability decreased and their wellness status, as measured by the OLP total score, improved.
- Most of the positive effects became statistically detectable after 2-3 months of regular training.

I emphasise that on the basis of a new approach

- their health orientation is strengthened when examined according to the trans-theoretical model.
- sense of coherence was strengthened; the results of research on the relationship between sense of coherence and physical activity are contradictory in the literature. My results demonstrate a strong interdependent relationship between participation in recreational training and SOC.
- Furthermore, a sense of coherence is not only an indicator of mental health (as some authors suggest), but also a characteristic and predictor of physical health.

8. Strengths and weaknesses of the research

It would have been inappropriate to change the well-established exercise regimes that I had compiled in my research 18 years ago, which were considered modern in the field of recreation at the time.

The strength of the research is that it has used previous projects and has sought to be as comprehensive as possible. The emergence of the pandemic created experimental conditions to which the research was quickly adapted, thus providing relatively exact support for the hypothesis that a relatively stronger sense of coherence can induce more adaptive behaviour in severe stressful situations, thereby moderating the negative effects of stress.

Another strength of the research is that it can be followed up, which allows for more accurate conclusions.

A weakness of the research is that the sample size is relatively small (due to the pandemic in the 2nd and 3rd phase of the research), but it was possible to keep the same principles all the way through.

9. Conclusion

The health status of the Hungarian population, the mortality rate from physical inactivity (and nutrition) related diseases and the proportion of overweight and obese people all point to the need for recreational training programmes that take into account the physical, mental and spiritual health of the individual, and motivate them to engage in regular physical activity, strengthening their sense of coherence and health orientation, as confirmed by my research. These programmes are most effective when they are led by highly educated personal trainers with sound physiological, anatomical, psychological and pedagogical methodological knowledge. Based on my research experience, heart rate monitoring is recommended during exercise to monitor, prevent and screen for circulatory problems.

10. Proposal

There is a need to develop a subject-specific curriculum on salutogenic interventions for fitness and wellness professionals and coaches, which takes into account the physical, social and mental health and well-being aspects of the client. Intervention strategies can be offered as an option to clients. When seeking the help of a professional, the professional should adapt to the client's priorities, abilities and motivation. This should be done in a person-centred, resource-oriented way.

Existing coaches should be given the opportunity to learn the application of salutogenic processes in the framework of further training, and future professionals should be given the opportunity to learn how to develop people's sense of coherence and have this competence as a teaching material. It is also important to take into account the client's psychological abilities, so that they are able to develop motivational skills in their clients. On the one hand, it is necessary to enable professionals to increase their clients' needs related to health improvement, and on the other hand, it is necessary to develop additional programmes to improve the health orientation of recreation programme participants. This will reduce the economic and health burden, prevent obesity-related diseases and deaths resulting from sedentary lifestyles and also make the work of professionals more effective. Where possible, trainers should encourage the use of smart watches in training, as they are now available in almost every household, so that circulatory data can be monitored.

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Publications

Publications related to the thesis

First author IF on the topic of the thesis

1. Szovák E., Varga K., Pelyva I., Soós R., Jeges S., Kívés Zs., Tóth Á.: Insights Gained in the Aftermath of the COVID-19 Pandemic: A Follow-Up Survey of a Recreational Training Program, Focusing on Sense of Coherence and Sleep Quality : INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH (1661-7827 1660-4601): 17 24 Paper 9201. 17 p. (2020).

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2. Pelyva I., Kresák R.,Szovák E., Tóth Á.: How Equine-Assisted Activities Affect the Prosocial Behavior of Adolescents. : INTERNATIONAL JOURNAL OF ENVIRONMENTAL RESEARCH AND PUBLIC HEALTH (1661-7827 1660-4601): 17 8 Paper 2967. 13 p. (2020).
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