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Abstrakt
Introduction: Cardiovascular diseases (CVD) are the most common non-communicable disease and a leading cause of death. Despite scientific knowledge suggesting that CVD might be preventable to a large extent, cardiovascular diseases in Slovakia account for 50% of overall mortality. The most important condition to prevent CVD is patients’ involvement in the management of their own health. Aim: Based on the theoretical analysis and own research, this study aimed to expand the knowledge and investigate patients’ awareness of the importance of physical activity in the prevention and treatment of cardiovascular diseases. Methods: This study was supported by the Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences under the VEGA Grant No. 1/0825/17 „Recommendations for physical activities in prevention and control of non-communicable diseases and their implementation in the eastern part of Slovakia.“ The survey participants comprised 361 cardiovascular patients. For data collection, we used a non-standardized questionnaire that contained 29 questions and was designed for a total completion time of 20 minutes under the supervision of an administrator. Results and discussion: Most patients (93.7%) obtained information about their health problems and treatment options from general practitioners. 60.6% of the patients recognized the positive impact of regular PA on their health problem. Up to three-quarters of all patients received such information from nursing staff, of those one-quarter was informed in details and nearly half of all respondents were aware of minimum PA requirements, even for patients at risk. This finding does not correspond with the level of importance patients assign to individual factors influencing the prevention and treatment of CVD. They put the most significant emphasis on diet and nutrition, followed by regular medical checkups, and only one-third recognized the importance of the physical activity. Nevertheless, it reflects the actual state since the same number of patients performs regular PA three times a week or more. Conclusion: The results uncovered attitude discrepancies towards physical activity. While most patients admit the positive impact of PA, only one-third meet the recommendations.

Keywords
cardiovascular disease, physical activity, information, patient, therapy

INTRODUSTION
Cardiovascular diseases (CVD) are the most common non-communicable disease and a leading cause of death rate. (Booth et al. 2012, WHO 2010). Despite scientific knowledge suggests that CVD might be largely prevented, cardiovascular diseases in Slovakia account for 50% of overall mortality (Lipták, 2007). The most important condition to prevent CVD is patients’ involvement in the management of their own health. There is an extensive scientific and practical evidence suggesting that physical inactivity constitutes the most significant risk for non-communicable disease. According to WHO, physical inactivity is now identified as the fourth leading risk factor for global mortality,
which accounts for 3.2 million deaths worldwide. Farrell SW et al. (2013) describes a causal relationship proposing the lack of physical activity (PA) and the resulting low cardiorespiratory fitness are independent predictors of morbidity and mortality with a direct negative impact on the quality of life. PA is considered a cost-effective, non-pharmacological intervention available to all age categories. (Fletcher GF 1996, U.S. Department of Health and Human Services 1996). It also reduces morbidity and mortality in most non-communicable diseases.

The main health-related objective of the society is to improve the overall public health and physical fitness of all individuals. Therefore, sport and physical activity should be actively promoted among healthy persons and persons with multiple cardiovascular (cardio-metabolic) risk factors, who are allowed to perform PA in order to improve the cardiorespiratory system and general fitness (Meško 2009).

PURPOSE
Based on the theoretical analysis and own research, we aimed to expand the knowledge and investigate patients´ awareness of the importance of physical activity in the prevention and treatment of cardiovascular diseases.

METHODS
This study was supported by the Scientific Grant Agency of the Ministry of Education, Science, Research and Sport of the Slovak Republic and the Slovak Academy of Sciences under the Grant No. 1/0825/17 „Recommendations for physical activities in prevention and control of non-communicable diseases and their implementation in the eastern part of Slovakia. “ The survey was conducted from 10/2018 to 2/2019 at 19 cardiology clinics in eastern Slovakia and included 361 patients (154 males and 207 females) with different CVD diagnoses, in particular, hypertension and the small number of heart arrhythmia diagnosis. The average age of respondents was 57.2 years, 220 respondents fall into the urban resident category, and 140 identified themselves as rural residents. In terms of education, more than three-fourths were secondary school graduates with leaving certification, and one-fourth completed higher education. For data collection, we used a non-standardized questionnaire that contained 29 questions and was designed for a total completion time of 20 minutes under the supervision of an administrator. Most questions were closed-ended, with the option for respondents to elaborate on a specific response and were of a factual nature. The first seven questions focused on sociodemographic indicators, four questions covered patients´ medical condition and awareness of the medical condition, 14 questions dealt with PA and awareness of PA, and four questions focused on the selected lifestyle factors.

After completing the questionnaire, the respondents obtained a colorful brochure containing recommendations on PA and a healthy lifestyle with regard to their diagnosis.

RESULTS AND DISCUSSION
At first, we investigated the level of information patients had about their medical condition. If the patients reported sufficient information, we were further inspecting the source. We found that more than half of the respondents (55.7%) had ample information about their diagnosis. 37.1% were somewhat informed but opened to more detailed information. Only 7.2% had no diagnosis-related information.

Most patients (93.7%) obtained information about their health problems and treatment options from general practitioners. 60.6% of them recognized the positive impact of regular PA on their health problem (Fig. 1). Up to three-quarters of patients received such information from nursing staff, one-quarter of them, highly detailed.
This finding does not correspond with the level of importance patients assign to individual factors influencing the prevention and treatment of CVD. They put the most significant emphasis on diet and nutrition, followed by regular medical checkups, and only 38.2% recognized the importance of the physical activity.

Therefore we investigated the role of doctors and nursing staff in providing information about the importance of PA in the prevention and treatment of CVD. More than a quarter of patients (26.6%) reported that had detailed information. Less than half (46.9%) recall that some information was mentioned in general, 13.4% of patients were informed from other sources. 6.9% would welcome such information, and only 6.3% of patients did not consider such information necessary. Nearly half (44.6%) of all respondents were aware of minimum PA requirements, even for patients at risk. Even though 14.6% of subjects had partial information on this topic, they did not find it important. Up to 40.1% of patients did not obtain such information at all, but 12.6% of them were particularly interested.
In assessing factors that influence the prevention and treatment of CVD, we found that 38.2% of respondents considered PA to be the most important tool. This finding strongly correlates with responses regarding the frequency of PA (Fig.). Nearly the same numbers of patients (38.8%) performed PA at least three times week or more.

Assessing physical activity, we found that nearly three-quarters of respondents preferred housework and gardening; more than 50% favored brisk walks and hiking. It was interesting to find out that 28.8% of respondents actually took part in any particular sport and recreational activity. Fig. 4 presents a daily duration of physical activity. The results show that more than three-quarters of respondents reported more than 20 min duration of physical activity. In further investigation we found, that subjects in this subgroup were physically active (optimally aerobic) from 20 to 60 min. However, our experiences and type of PA performed by patients in this survey suggested that these activities were carried out at moderate intensity. Data on
PA intensity obtained from the specially designed Borg scale with attached examples confirmed this assumption, 70.1% reported moderate PA ranging from "no effort" to "little effort" Only a quarter (24.9%) of respondents performed vigorous activity characterized by sweating and rapid breathing.

**CONCLUSION**

As expected, the results showed difference in attitude towards physical activity. Patients are well informed about their health condition and the importance of PA for the prevention and treatment of CVD. Furthermore, while most patients admit the positive impact of PA, only one-third meet the recommendations. Patients mostly perform moderate-intensity PA with little or no effort, which strongly correlates with findings in the general population. This fact calls for effective interventions in education, which should stress the importance of PA within the reflection of socio-economic changes. This paradigm is valid for healthy people as well as people with health diseases.

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http://www.vpl.sk/sk/kardiovaskularna-prevencia/


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THE ASSESSMENT OF THE WELLNESS PROGRAM’S EFFICIENCY ON THE PSYCHOLOGICAL WELL-BEING IN A GROUP OF MEN AND WOMEN AGED BETWEEN 50 AND 65 YEARS

Daniela STACKOVÁ, Monika ČIHÁKOVÁ

Abstrakt
This article is focused on the effect of the physical activity program on the psychological well-being in a group of men and women aged between 50-65 years. We used these methods for diagnostic: a bespoke questionnaire focused on motivation, the standardized POMS questionnaire (Profile of Mood States) to measure actual psychical state items and three exercises of the standardized test battery UNIFITTEST (6-60) to test motor efficiency.

The first questionnaire analyzed the motives of respondent for entering the program. The results showed that the most frequent motives are the pleasure of movement, the improvement of physical fitness, the need of active relaxation and the relief of stress.

The results of the second questionnaire ascertained statistically significant effects in two items of the actual mood state – tension and fatigue. The physical activity program reduced anxiety and at the same time it caused a drop in feelings of fatigue. The test of motor efficiency was conducted in three selected exercises – long jump from a spot, sit-up repeatedly and deep bending forward a sitting position. It showed that the program has a statistically significant effect on the efficiency in all three selected motor exercises that were undertaken by respondents.

There were 16 people involved in the research, 3 men and 13 women. The average age was 57,8 years. The physical activity program was given two times a week, each lesson lasting 60 minutes. It consisted of two types of exercises. The first type of exercise was focused on developing balance abilities and engendering muscle balance. The second type of exercise – health physical education – was focused on the maintenance and improvement of flexibility and the development of muscle power and stamina. Respondents could participate in one or both of the exercises every week.

Keywords
quality of life, motoric tests, physical activity, Profile of Mood States, well-being

INTRODUSTION
Ageing is traditionally associated with psychological changes. In terms of emotionality, elderly people tend to be more suggestive and therefore easily influenced, more likely to be inclined to fear, for example, from falling, fear of no self-sufficiency, or loss of a close person and loneliness resulting into an anxiety or depressed mood of the senior, may occur. It might change values and needs also attitudes towards other people and society (Vágnerová, 2007).

In general, we can say that quality of life in old age is highly influenced by functionality of the health (in particular, mobility, cognitive abilities, pain and depression), upbringing and education, value system, personality characteristics, property conditions, the social network including the family, friendly environment, the effectiveness and real availability of support services and early interventions - healthy, social, psychotherapeutic and spiritual. (We watched a group of 50-65 year-olds in our work, not just the real
A constructive age managing strategy is usually associated with an active lifestyle and regular targeted exercise. With a number of specific benefits, both somatic and psychological. The key issue is motivation to do the physical activity.

The survey about motivating older people to do physical activities has shown that the most prominent motivating factor is for elderly people a circle of friends who are related to the exercise, secondly, medical reasons and recommendations from GP, and the third most important motivational impulse is an example from the family environment. The most frequently cited factors that keep seniors away from a regular physical activity are physical factors (illness, fitness, health), mental factors (not feeling like an athlete and thus not experiencing the feeling); social factors (feeling ridiculous or intimidated), and environmental factors (poor accessibility, poor training environment). It has been shown that the rationale reasons for regular exercise is not enough to simply rationalize the motivation, that is to say, that physical activity is beneficial for health. People also need an emotional experience of motion, the joy of the atmosphere and the cooperation as part of the exercise (Štilec, 2013).

The psychological benefits of physical activity in old age have been demonstrated by a number of scientific studies. Significant is its effect on the cognitive function.

Stuart-Hamilton (1999) states that a healthy body is certainly more powerful, utilizing the nervous system better, and thus the psyche works better. An older person who feels well and healthy will have more self-confidence and hence a higher motivation for a good performance in mental activities.

Hátlová (2010) sees the benefits of regular exercise in a gradual increase in self-confidence. Seniors perceive the value of exercises in gaining new experiences and new social contacts. A positive phenomenon is increased vitality, at the same time, the joy of finding their condition and health improving. It is proven that exercise helps maintain brain function, slows down cardiac function deterioration, muscle deterioration and joint immobility. Seniors who regularly practice physical exercise have better image of themselves.

Ettinger et al. (2006) understands the positive effects of physical activities in old age in controlling body weight, reducing the risk of diabetes type 2, certain types of cancer (e.g. breast, bowel, prostate and lung cancer), maintaining strong bones, relieving joint stiffness, and memory improvement and self-sufficiency.

According to many authors the benefit of physical exercise is primarily in terms of self-confidence and fitness, in maintaining the extent of joint motion, in preventing a large number of illnesses, bad moods and in delaying the ageing process. Of course, it is necessary to take into account the progressively aggravating physical condition of the ageing person whose increasing age is decreasing ability to move, changes in balance occur which, together with deterioration of visual abilities result in poor coordination of movements and influencing the walk and posture of the body.

Hošek (2013) points out the contribution of physical activities in the social field, which is comparable to the biological benefits of the anatomical-physiological field or even more significant. One of the main problems of seniors is loneliness. Elderly people often prefer to practice alone due to the shyness, unwillingness to personal presentation and social comparison, including awareness of the decline in performance and aesthetic moments in the area of their own physicality. The social benefit is, above all, mainly overcoming the isolation, loneliness, social response and social support in joint
activities, group experiences, fun, group creativity and game moments.

OBJECTIVES AND CONCEPTS OF EXERCISE PROGRAMS FOR THE ELDERLY

One of the basic conditions of maintaining mobility associated with personal independence of the elderly is sufficient strength that is related to the amount of muscle mass.

Strength training is the key to preventing the development of sarcopenia (Cruz-Jentoft, 2010). The effects of strength training are highly specific, depending on the type of exercise, on the muscular groups involved and on the chosen exercise. The basic requirement for building the muscles is to maintain the balance between strength, stretching and relaxing the muscles. The intensity of the strength load should be only 30-60% of the maximum muscle strength. Simple exercises with rubber belts, overballs, gymnastic balls, kalanetics or other forms of isometric work out, resp. work out on the ergonomically designed fitness simulator. Strength exercises are also effective in maintaining bone quality and preventing the development of osteoporosis. The motion range of joints can be maintained by appropriate stretching exercises. Endurance training is particularly important in the field of prevention of cardiovascular diseases.

With age is the impact of various diseases and weaknesses increasing, which exacerbates the tactile sensitivity, muscle strength, visual control, and range of motion, which is manifested by certain instability of the posture and a general decline in coordination and dexterity. The continuous maintenance of coordination skills through physical activities is of undeniable importance for the elderly in terms of the prevention of injuries and falls.

In order to stimulate coordination skills, coordinated more intensive exercises are used, more complicated activities involving more muscles, simultaneous movements of the torso and limbs in different directions and according to different axes. Acquired exercises are also carried out under changing conditions, as automated skills are no longer contributing to the further development of coordination skills. When developing the coordinating skills, must be taken into account the age and ability of the individual senior. Exercise must be reasonably fast and coordinated, mostly focused on the limbs. Agility-coordination exercises of the body must be integrated very carefully, as there is a risk of the balance loss. Equally dangerous are fast motions with rotations, turns, bends, skips or positions on one leg. Suitable exercises include, for example, simple sets of easy exercises, round dances, fun games and changes in direction of motion in a limited space, step variations and balance exercises (Štilec, 2013). Simple balancing exercises are also important for preventing falls of seniors, especially at later senior's age.

SENIOR FITNESS PROJECT

The Senior Fitness project was originally named "Exercise for Every Day" in the mid-1980s at Faculty of PE and Sport, the Charles University. The aim of the project was to create conditions for the physical activities of seniors and individuals in the pre-elderly.

Currently, the Senior Fitness Project provides regular exercises for various age and performance groups of seniors, including those who are physically weak. The aim of the program is to maintain and extend the mobility of seniors and stabilize patients with chronic illnesses.

Within the Senior Fitness Project, exercise lessons are held in gyms, fitness centers and other sports centers in almost all Prague’s city districts; another exercises are organized outside the capital city (e.g. in České Budějovice, Liberec, Brno and others).

The Senior Fitness Project can be accessed by anyone regardless of age,
but the most appropriate and also the most represented age group is people over 50 years old.

The program of individual exercise lessons is designed to improve the physical and mental health of seniors. The basics of training units are elements of psychomotor exercises and physical healthy exercises (i.e. coordination and balance exercises, relaxation, stretching and work out exercises, breathing and relaxing exercises, gymnastics, exercises with music, fitness, sports games, exercises in water and swimming). The intensity of the exercise and the content of the exercise lessons are always adapted to the physical and psychological status of the trainees. The Senior Fitness Project also organizes tourist trips, sightseeing trips and sports and recreational stays in the Czech Republic and abroad.

The main benefits of regular physical activity in the Senior Fitness Project are physical and functional development, fixation and maintenance of physical abilities, maintenance and improvement of motion and skill habits, compensation of unilateral motor activities and bad habits, stress reduction, social bonding in group activities and the discovery of health complications with subsequent redirection to the medical and rehabilitation care.

MATERIAL & METHODS

Our goal was to find out if the physical exercise program within the Senior Fitness project can positively influence the components of the actual mental state of the group of men and women aged 50-65, i.e. whether their psychic status can be optimized through physical activity. Selected tests of the UNIFITTEST (6-60) test battery were used to investigate whether the physical condition of the test group had improved during the program course, and to assess the effect on the psyche in relation to the physical condition development.

The researched group consisted of a group of men and women between the ages of 50 and 65 who voluntarily chose the physical exercise program within the Senior Fitness Project to improve their physical and mental fitness. The youngest respondent was 50, the oldest 62 years. The average age of the respondents was 57.8 years. The total number of people surveyed was 16, of which 13 were women and 3 were men. From the point of view of gender, women prevailed. The reason for this was the reluctance of men to take part in the research or their age beyond the limit for this research.

First, contacting Eva Ondříková, who leads several sessions for seniors within the Senior Fitness Project. Ms. Ondříková began practicing in 1996 as one of the founding members and lecturers of a successful female fitness club focused on reducing the weight of obese women.

In order to investigate and subsequently analyze the changes in the mental state of the examined group of men and women aged 50-65 years, two specific types of SFP exercises were selected. Together with Mrs. Ondříková, we selected a group of suitable respondents from her trainees, focusing with a suitable age group, on those respondents who entered the project or exercise at least five months before starting the research, i.e. not earlier than October 2013. These people were approached and asked to collaborate on research work. They were also acquainted with the way they were investigated and also assured of anonymity in the processing and the use of measured data.

The survey was launched in February 2014 when respondents were asked to complete the first part of the questionnaires, i.e. the POMS questionnaire and the motivation questionnaire. At the same time, the respondents were acquainted with the three selected exercises from the UNIFITTEST (6-60) battery test, which were performed in smaller groups.

The second part of the research took
place in October 2014, eight months after the first test. The same respondents were given the second part of the questionnaires, i.e., the POMS questionnaire and the motivation questionnaire. At the same time, a second round of the same tests from the UNIFITTEST test battery (6-60) was performed.

The intervention program consisted of two specific types of exercises - exercises with aids (rubber belts, gymnastic balls, overballs, and dumbbells) and "traditional" healthy physical education. Each exercise was on a different day (Monday and Thursday) regularly once a week for eight months. Respondents could attend either of these two exercises or both exercises within one week. The lesson was changed a bit, only the core exercises remained the same.

The research was carried out using quantitative methods, namely:

- Affective Status Questionnaire – POMS
- Questionnaire for finding motives to do regular physical activity of their own design
- UNIFITTEST (6-60) - selected tests.

A standardized POMS questionnaire was used to diagnose the current mental state. For statistical processing of POMS results were used non-parametric methods, namely unilateral Wilcoxon pair test. To diagnose motor performance were used selected exercises from the UNIFITTEST battery test (6-60). The statistical significance of the difference in performance in the individual tests was tested using the unilateral paired t-test.

Profile of Mood States (POMS: The original version of McNair, Lorr, Droppleman, 1971, 1981) is a method used to shape emotional states and moods, especially in connection with the need to monitor the effects of short-term therapies, psychotrophic medication, sleep deprivation, induction of emotions and other similar experimental interventions into the experience of persons under the investigation. It is considered to be a quick and economical method for detecting transient, short-term affective states. In the original version, the questionnaire contained 65 items. For the purposes of this research, the shortened Czech version of POMS (Stuchlíková, Man, Hagtvet) from 2005, was used for measuring and contains 37 items. The investigated person evaluates the offered adjectives on a five-point scale from "not at all" to "very much".

The POMS questionnaire was used twice in this work. For the first time, respondents completed it at the beginning of the program in February 2014, most likely immediately before joining Senior Fitness Project. At this stage of research was investigated how respondents felt at the beginning of the research before the start of the intervention program. Again, the same respondents filled in questionnaire after eight months in October 2014. At this stage the survey found out how respondents feel after a period of regular exercise activity in the past eight months.

The purpose of the measurement was to compare the mental state of the group of men and women aged 50-65 at the beginning of the intervention program and after eight months. The input data were imported into the R software, The R Project for Statistical Computing (version 3.22), statistical analysis using unilateral pair Wilcoxon Test.

The questionnaire focused on the motivation of their own construction respondents received at the beginning of the research in February 2014 and at the end of the survey in October 2014. The time from the entry of the respondent into the Senior Fitness Program, motives for SFP entry and the expectations of the respondents from SFP was determined. If they were sporting in their youth and their main motives.

Three test exercises from the UNIFITTEST (6-60) test battery (Chytráčková, Měkota, 2002) were used to test motor performance - see Table 1.
Motor performance testing was performed twice in total. The first testing was done at the beginning of the program in February 2014, most likely immediately after the entry of the respondents into the Senior Fitness Project, the second testing was done with the same respondents after eight months, i.e. in October 2014. Four statistical methods were used for statistical evaluation: F-test, Shapir-Wilk test, the T-test, Wilcoxon Pair Test.

RESULTS
What are the reasons entering the Senior Fitness Project, resp. motives for physical activity by the clients, and what are their psychological and physical expectations?

Table 1: Selected motor tests from the UNIFITTEST (6-60) test battery (Chytráčková, Měkota, 2002)

<table>
<thead>
<tr>
<th>Marking and test name (measurement)</th>
<th>Exercise task (goal)</th>
<th>Skills set</th>
<th>Results evaluation (measurement accuracy)</th>
</tr>
</thead>
<tbody>
<tr>
<td>T 1 Standing jump</td>
<td>Reach the longest distance jumping from a spot with legs together</td>
<td>Dynamic – rapid explosive – strength skill</td>
<td>Distance in cm (1 cm)</td>
</tr>
<tr>
<td>T 2 Laying-sitting repeat</td>
<td>Make max no. of repetitions changing laying-sitting position in 60 s</td>
<td>Dynamic endurance strength skill</td>
<td>No. of repetition (1 exercise)</td>
</tr>
<tr>
<td>T 4-3 Deep forward bend in sitting position</td>
<td>Reach the furthest with finger tips in deep bend forward in sitting position</td>
<td>Mobility skill</td>
<td>Distance in cm (1 cm)</td>
</tr>
</tbody>
</table>

The main reason and motivation for sport is the joy of motion for more than half of the respondents, followed by the motive of fitness and the possibility of active rest. While the first reason maintains the same position in the youth, the improvement in fitness as a reason for sporting in youth has shown a negligible number of respondents. Other preferred reasons for joining SFP are to relax from stress, which is a slight increase compared to youth motivation and social contact that holds the same position.
On the contrary, a new motive appears, namely body shaping, which was not mentioned by any of the respondents in the youth. At the end of the motivation ladder is weight reduction, fitness increase, resilience increase, free time and prevention of civilization diseases.

**POMS**

Will there be a positive influence, i.e. the decline in negative emotions, after the regular use of the intervention program as part of the Senior Fitness Project?

### Table 3: Data from POMS (for statistical analysis)

<table>
<thead>
<tr>
<th>category</th>
<th>time</th>
<th>r1</th>
<th>r2</th>
<th>r3</th>
<th>r4</th>
<th>r5</th>
<th>r6</th>
<th>r7</th>
</tr>
</thead>
<tbody>
<tr>
<td>D item</td>
<td>before</td>
<td>0.43</td>
<td>2.29</td>
<td>1.00</td>
<td>0.71</td>
<td>0.86</td>
<td>0.71</td>
<td>0.00</td>
</tr>
<tr>
<td>A item</td>
<td>before</td>
<td>0.83</td>
<td>0.50</td>
<td>0.50</td>
<td>0.67</td>
<td>0.00</td>
<td>0.67</td>
<td>0.33</td>
</tr>
<tr>
<td>T item</td>
<td>before</td>
<td>1.00</td>
<td>2.00</td>
<td>0.67</td>
<td>2.33</td>
<td>0.67</td>
<td>1.67</td>
<td>0.33</td>
</tr>
<tr>
<td>F item</td>
<td>before</td>
<td>1.17</td>
<td>2.17</td>
<td>1.83</td>
<td>1.17</td>
<td>1.50</td>
<td>2.00</td>
<td>1.00</td>
</tr>
<tr>
<td>V item</td>
<td>before</td>
<td>1.17</td>
<td>0.67</td>
<td>2.33</td>
<td>0.67</td>
<td>1.17</td>
<td>2.00</td>
<td>2.33</td>
</tr>
<tr>
<td>C item</td>
<td>before</td>
<td>0.75</td>
<td>1.25</td>
<td>0.75</td>
<td>0.25</td>
<td>0.50</td>
<td>0.75</td>
<td>0.25</td>
</tr>
<tr>
<td>D item</td>
<td>after</td>
<td>0.43</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.14</td>
<td>1.29</td>
<td>1.29</td>
</tr>
<tr>
<td>A item</td>
<td>after</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.00</td>
<td>0.33</td>
<td>0.83</td>
<td>0.83</td>
</tr>
<tr>
<td>T item</td>
<td>after</td>
<td>0.00</td>
<td>0.33</td>
<td>1.00</td>
<td>0.33</td>
<td>0.67</td>
<td>1.33</td>
<td>1.00</td>
</tr>
<tr>
<td>F item</td>
<td>after</td>
<td>0.83</td>
<td>0.33</td>
<td>1.17</td>
<td>0.67</td>
<td>1.00</td>
<td>2.17</td>
<td>1.50</td>
</tr>
<tr>
<td>V item</td>
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Reliability of the data obtained was measured using a Cronbach alpha coefficient. The detected value of 0.74 is higher than the 0.7 limit and therefore the data obtained can be considered as sufficiently reliable.

The given data is based on the questionnaire; it is not possible to assume the distribution normality. Therefore, non-parametric method namely the unilateral Wilcoxon pair test was used for testing. Tested was always zero hypothesis that the rating in the category did not change against the alternative (i.e. reducing average response, with the exception of category vitality, where improvement means an increase in the average response). The Wilcoxon pair test results are reported in Table 4.
The statistical evaluation clearly did not show that there would be a positive influence after the regular use of the intervention program, i.e., the decrease in negative emotions, respectively the increase of positive emotions. From six tested categories of emotion, only two statistically significant influencing, namely tension and fatigue. However, it should be noted that in the other three categories, the level of tests was just above the 5% threshold. It can therefore be assumed that if more respondents were included in the research or if the research lasted longer, the test strength would increase and zero hypothesis would be rejected even in these cases.

**UNIFITTEST (6-60)**

Will the regular performance of the Senior Fitness Project intervention program have an efficiency improvement of the selected exercises?

### Table 4: Statistical analysis of POMS results

<table>
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It is clear from the results that in all motor tests, men and women, in terms of average, have improved performance. For men, improvement in average performance is more pronounced as their physical condition was weaker at the start of the program than women’s. The most noticeable is the improvement of men in the T1 and T4-3 tests, where average performance improved by more than 6 cm. It was the expected development, as both intervention exercises are aimed, among other things, at increasing mobility and flexibility.

With the UNIFITTEST (6-60) motor tests, it was found that the performance of
the test subjects in all three selected exercises improved after a six-month intervention program (statistically significant at 5% significance level).

**DISCUSSION**

The motivation questionnaire method was used to determine the motivations of respondents to enter the Senior Fitness Project. Most notably, the joy of motion was related to the physical activity, followed by the motive of improving fitness and the possibility of active rest. Other motives include relaxation from stress and social contact. The marginal motive was, for example, body shaping, weight reduction, resilience, leisure time and prevention of civilization diseases.

In a similar study of Mudrák, Slepička and Slepičková (2013) aimed at motivation for physical activity in seniors aged over 60 years, the most important motivational construct showed perceived self-efficacy and social support. The results suggested that physical activity may not primarily be related to planning and exercise strategies, but may be largely habituated reflecting previous experience with physical activity. This trend can be seen in our research, with 13 out of 16 respondents having an active sporting or physical activity experience from their youth.

From the above, it follows that respondents expect to benefit from their participation in group exercises not only in terms of physical and social part, but also psychologically. This confirms the importance of physical activity for feeling of satisfaction, which is based on subjective experience and contributes to maintaining the necessary physical and mental performance (Křivohlavý, 2013).

The aim of the work was to find out if the physical program as part of the Senior Fitness Project can positively influence the components of the current mental state of the group of men and women aged 50-65. It is generally accepted that there is a desirable relationship between physical activity and psychological status, as presents Hendl (2007) in surveyed studies, as (Arent et al., 2000). It emerged that physical activity can be beneficial in emotional tuning of elderly people. When comparing age variables, older people showed even greater moods improvement than others. According to Křivohlavý (2013), the positive impact of exercises on depression, anxiety, positive self-esteem and the strengthening of the psyche in the fight against stress have been proven. Some studies have shown a significantly higher effect on the reduction of depression by means of aerobic exercise than using classical relaxation-type of psychotherapy. At the same time Křivohlavý states that satisfaction and happiness of older people has a positive relation to their activity and vitality, the higher the activity, the higher the feeling of satisfaction.

A verbal questionnaire POMS was used to diagnose the psychological status of respondents entering the Senior Fitness Project. The statistical evaluation of the measured data showed that after the regular use of the intervention program, there was a statistically significant influence, i.e. the decrease of the negative emotions, in two categories - tension and fatigue.

Stackeová (2007) in her study focused on the change of the current mental state due to fitness exercises in the fitness center, where the same type of questionnaire was used, found that the items of tension, depression and anger had a statistically significant decrease in the mean value, the item vitality had a statistically significant increase in the value after completing the training unit. Stackeová further states that the anxiolytic effect of physical activity on the psyche is mediated mostly by the change in the muscular system, with other factors such as the repetition of a certain movement in a regular rhythm. It is shown that skeletal muscle reflects the state of emotions and excessive mental tension...
increases the muscle tone.

The results of the Landers study (in Hendl, 2007) from 1994 also showed the relationship between the anxiolytic effect of exercise and the initial value of anxiety and physical fitness. According to this study is bigger effect achieved in low-performing individuals or highly anxious individuals. At the same time, it has been shown the larger effects are achieved with longer programs, up to more than 15 weeks.

There is a rising need to compensate tension arising from day-to-day managing personal, work and other social activities. Therefore, an active feeling of balance based on conscious and visible relaxation and satisfying the natural need for movement must be induced. This is an important argument for not neglecting physical activity for senior practitioners.

One of the main goals of the intervention program was to improve balance in terms of balancing abilities that are directly related to posture and harmonizing the muscle tension. The statistical evaluation confirmed the suitability of the program to reduce the feeling of tension, which is in direct relationship to muscle tension. In Stins et al. study (2009) focused on the application of balancing exercises to treat individuals with anxiety disorders were also achieved positive changes in the mental state due to this exercise.

There was no statistically significant improvement in the other three categories (confusion, anger, and depression) but the level of tests was just above the 5% threshold. Therefore, it can be concluded that the intervention effect was also positive in these categories. The question remains whether a higher number of respondents or other lengths of the intervention program would increase the test power and zero hypothesis would be rejected in these cases as well.

Analysis of the motor test data from the UNIFITTEST battery (6-60) and the subsequent statistical evaluation of the performed tests showed the statistical significance of the difference in all three tests used. The test results of the selected three exercises surprisingly showed the most significant improvements in the long jump from the spot (men improvement by 6.67 cm, women improvement by 2.07 cm). It should be emphasized that the intervention program was not targeted at the “traditional” work out for the lower limbs; on contrary the exercises with a slow controlled, experiencing the movement prevailed. Improvement of the dynamic, explosive strength of the lower limbs can be attributed to the balancing exercise on the ball, which in addition to practicing coordination skills also effectively develops the speed of reaction to various stimuli, strength and mobility. Significant improvement was also seen in men at the depth of bend (improvement of 6.64 cm), which however, due to the nature of the intervention exercise could be expected.

Although the main objective of the research was not to assess the effect of the intervention program on motor performance, the group was not sufficiently large to form a generally valid conclusion, it can be deduced from the research results that regular exercise allows a demonstrable improvement in motor skills in people over 50, (finding that, although it was a healthy exercise not an exercise with typical conditional goals, its effect on motor test results is quite large).

CONCLUSIONS

The research has shown that there has been a statistically significant impact on two categories, namely tension and fatigue. The influence of the chosen intervention exercise on the mental state of the elderly can be specified as anxiolytic and simultaneously acting in the sense of reducing the feeling of fatigue.

The research has not shown a statistically significant positive effect, ie an increase in positive emotions. This fact can be attributed either to the satisfaction and
subjective feeling of the higher level of the respondent's vitality, or to the form of the chosen intervention exercise which in its nature did not affect feelings such as full elation, energetic, vigorous, cheerful and active, thus emotions associated with vitality.

The statistical evaluation of the results of the Motor Tests UNIFITTEST (6-60) showed that after the completion of the program there was a statistically significant improvement in all three selected tests.

The aim of the physical activity performed by a senior is not the achievement, but the personal, physical and psychological fitness of a person. Suitable physical exercises can, to a large extent, reduce age-related changes, positively influence the quantity and quality of muscle mass, and thanks to the active lifestyle, psychosocial and physical abilities can be maintained until a high age. Even a slight physical activity improves the prerequisites for physical work and, at the same time, it has a positive influence on involution psycho-physical processes. Increasing physical fitness is associated with the functional independence of seniors, their self-sufficiency and better mobility, which ultimately leads to psychological well-being and positive psychic tuning. Thanks to physical exercise, mental well-being can be maintained or even improved in an elderly age, thus contribute to improving the quality of life of seniors.

Declaration: Authors of the article have no conflicts of interest.

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DOES AN ARTICULATION OF MOVEMENT PATTERNS EXIST?

Miroslav TICHÝ

Abstrakt
Presented paper aims to introduce a new view on skeletal muscle function. Clinical experience shows that skeletal muscles located around one joint do not behave uniformly. Some of them play probably major role during movement (locomotion), the others take part dominantly in joint stabilization. Literature overview results in following conclusions: a) it is evident from anatomical textbooks that each skeletal muscle moves his joint around all movement axes available during natural (unconscious) movements, b) biomechanical studies show that each joint has its typical pattern of physiological movement. The pattern consists of characteristic simultaneous combination of movements around individual movement axes. Concurrently flexion and extension variant of the pattern can be distinguished. c) EMG studies show that muscles have different electrical activity during voluntary contraction. On the base of foregoing information, we can hypothesically assume that human body does not use all possible joint movement combinations during natural movements but it prefers only some of them. That is why we can divide the skeletal muscles surrounding a joint into two subgroups – pattern and not pattern muscles. The pattern muscles take part mainly in movement (locomotion). They provide either flexion or extension variant of natural movements. Not pattern muscles work in both variants simultaneously. They include movements from both joint patterns. That is why they play their main role in joint stabilization.

Keywords
skeletal muscle, locomotion, joint stabilization

INTRODUCTION
Skeletal muscles play dominant role in holding of body posture (setting of body segment to one another) and in movement of the body in space (locomotion).
Individual muscles differ functionally from each other and it is possible to classify them according to different criteria. The differences regard structure, metabolism connected with energy production, role in movement and communication, in delicate manipulation, in nourishment and in emotional and sexual behavior.

Anatomical textbooks classify skeletal muscles according to different criteria: function (flexors, extensors, …), length (short and long muscles), number of bellies (biceps, triceps, quadriceps), organization of muscle fibers to tendons (pinnation).

The physiologists take into account energy production for contraction of muscle fibers. There are two fundamental muscle fiber types – white and red. The first ones contract quicker but they are more fatigue able. The second ones contract more slowly but they are able to contract a longer time.

Rehabilitation view comes out from previous one. Each skeletal muscle consists of both muscle fiber types. Final functional property is dependent on ratio of both. The muscles containing greater number of white fibers are named phasic muscles, those including greater number of red fiber are termed postural muscles. The phasic muscles serve predominantly to locomotion, the postural ones to holding of body position. Civilized man uses the postural muscles much more than the phasic ones during sedentary lifestyle. It results in muscle imbalances.
affected for example spine curvatures.

Our clinical experience shows that skeletal muscles located around one joint do not behave uniformly. Some of them play probably major role during movement (locomotion), the others take part dominantly in joint stabilization. This aspect does not correspond to above mentioned classifications of skeletal muscles. The aim of this study is to find out scientific arguments for development of a new hypothesis dealing with a next, more functional criterion for muscle sorting.

ANATOMICAL FUNCTION OF SKELETAL MUSCLES

Each skeletal muscle of human body holds a position in space with regard to axial system of his joint. No muscle fuses with an axis. That is why we can postulate such a rule: each skeletal muscle provides simultaneously a movement around all axes in his joint. This is valid for natural (unconscious, involuntary, spontaneous) movement.

Anatomical textbooks describe anatomy of individual skeletal muscles including their function. We would expect, that the books describe movements around all axes present in muscle’s joint. Yes, it is so I most muscles. We introduce some examples.

A) Two axial joints

- Anterior tibial muscle moves the ankle simultaneously in directions of dorsal flexion and supination (inversion). Peroneus long and short muscles provide in the same joint plantar flexion and pronation (eversion).
- All of carpal muscles move the wrist around both axes. For example, extensor carpi ulnaris muscle provides at the same time dorsal flexion and ulnar duction, flexor carpi ulnaris muscle provides palmar flexion and ulnar duction and so on.

- Biceps femoris muscle flexes the knee joint and rotates is externally.

B) Three axial joints

- Teres major and latissimus dorsi muscles move the shoulder joint in directions of extension, adduction and internal rotation.
- Iliopsoas muscle provides in the hip joint flexion, adduction and external rotation.

But the textbooks describe function of some skeletal muscles incompletely. They stress obviously only so called main muscle function and description of other movements is missing. But we need to know movements around all axes to interpret correctly muscle function and its role in muscle slings. In these cases we can deduce the missing function according to position of the muscle to remnant axis. Two examples for all:

- Supraspinatus muscle works in three axial glenohumeral joint. The anatomical textbooks describe commonly its movements around two axes only and so shoulder abduction and external rotation. The question arises in this case: what movement does provide the muscle around the third axis? Is it flexion or extension? The muscle lies above the axis and passes from behind to the front. That is why it must provide shoulder flexion.
- Subscapularis muscle moves also the shoulder joint. Similarly to the previous muscle, only movements around two axes are introduced in the textbooks and so adduction internal rotation. The muscle is located below the third axis and goes from behind to forward. Its third movement must be extension.

More complicated situation comes in broad and flat muscles which are anatomically described like one structure.
In reality they consist of more functional units with different functions. We introduce two muscles for example.

- Serratus anterior muscle moves the shoulder blade. His one insertion lies on medial margin of the blade. Opposite muscle end inserts by typical teeth on nine cranial rips. Anatomical textbooks describe obviously only one shoulder blade movement – abduction. But this bone moves around three axes: elevation – depression, abduction – adduction and external – internal rotation of caudal angle (Kendall, F. P., McCreary, E. K., Provance, P. G., 1993). But according to muscle relation to remaining two axes, we can subdivide the muscle into upper and lower functional parts. Both of them provide shoulder blade abduction, but they strongly differ in remaining movements. The upper part provides elevation and internal rotation of the caudal angle, the lower part depression and external rotation of the angle.

- Gluteus maximus muscle repeats during its ontogenetic development the phylogenesis of this muscle (Tichý, M., Grim, M., 1985). In position of the definitive human muscle are located three independent muscles in reptiles (iliofemoralis, sacrofemoralis and caudofemoralis muscles). Later on step by step the three muscles fuse together. The muscle covers the hip joint from dorsal side. According to anatomical textbooks moves the muscle his three axial joint in directions of extension and external rotation. One movement around the third axis is missing. Is it abduction or adduction? Upper part of the gluteus maximus muscle lies above and lower part below the femoral head. It is clear from the muscle position that upper muscle part abducts and lower part addacts the hip joint.

We can conclude this chapter as follows: Each skeletal muscle in human body moves his joint simultaneously around all axes available in the joint. Anatomical textbooks confirm this statement in most muscles. But in some muscles they emphasize only main muscle function and movements around other axes are not described. But we need to know them because of better understanding of muscle function and its role in joint kinematics. Another conclusion regards broad and flat muscles. They have a common anatomical name but they may consist of more functional parts with different movement combinations around all joint axes.

NATURAL JOINT MOVEMENTS, PHYSIOLOGICAL JOINT PATTERNS

Anatomists classify joints according to different points of view. One of the points is a form of articular surfaces which determines another and functionally most important criterion and so number of movement axes. In this chapter we want to answer very important question: Does the central nervous system use during natural (spontaneous, involuntary) movements all possible movement combinations or does it prefer only some of them? We want to introduce some joint like examples.

The wrist

The wrist is a compound joint which includes several articulations: radiocarpal, mediocarpal, intercarpal and carpometacarpal. Like a functional unit, the wrist moves around two axes and provides two couples of movements: dorsal – palmar flexion and radial – ulnar duction.

Which of the above mentioned movements are combined in the wrist during natural movements? If we follow movement on the wrist during some daily activities (shoe brush, taking a glass and bringing it to
A mouth and so on), we can conclude that palmar flexion is combined with ulnar and dorsal flexion with radial duction.

The same movement combinations in the wrist are presented for example in Kabat’s method for the second movement diagonal in upper extremity (Voss, D. E., Ionta, M. J., Myers, B. J., 1985). Also biomechanical studies using 3D motion analysis methods support this opinion (Morimoto, H. et al., 2004, Kaufmann, R. et al., 2005).

The ankle

Ankle joint consist anatomically of two parts: talocrural (upper part) and subtalar (lower part) joints. Each part moves around another axis. The upper part of the ankle provides dorsal and plantar flexion, the lower part inversion and eversion.

Both ankle parts work like a one functional unit. And now (similarly to the wrist) one typical question follows: which movement combination around both axes is typical for natural movements?

The answer lies in biomechanical studies of the gait (Lundberg, A. et al. 1989). Stand phase of a step starts with initial contact of lateral heel margin. In this moment is the foot in dorsal flexion and inversion. In the next phase the foot falls down with the foot tip and medial (gross toe) margin towards a bottom in direction of plantar flexion and eversion. Just before heel off the shank moves ventrally (dorsal flexion in ankle joint), the foot toes flex and medial (gross toe) margin elevates (inversion) due to plantar muscles contraction.

As a consequence of this description, we can conclude, that during natural gait the dorsal flexion in talocrural joint combines with inversion in subtalar joint and inversely the plantar flexion goes together with eversion. These movements combination is possible to consider like natural movement combinations in ankle joint.

Shoulder blade movements

Shoulder blade is interconnected with trunk only by means of clavicle and its articulations (acromioclavicular and sternoclavicular joints). It means that a major role in shoulder blade fixation and movement play skeletal muscles with one attachment to the blade and second one to the neck and trunk. The muscle structure is described in each anatomical textbook.

Shoulder blade movements are dependent on upper extremity motion. That implies that the muscles interconnecting the blade with neck and trunk play very important role in crossing over of muscle slings (physiological or pathological) from trunk to upper extremity or inversely.

The shoulder blade moves in three axial system (Kenndall, McCreary, Provance 1993). Along vertical axis it moves upwards (elevation) or downwards (depression), along horizontal axis towards the spine (adduction) or towards the flank (abduction) and along ventrodorsal (rotational) axis around which the blade rotates with its lower angle either internally or externally.

In the same manner like in previous joints, we search for natural movement combination of the shoulder blade. From papers by (Kapandji, I. A., 1970, Karduna, A. R., McClure, P. W., Michener, L. A., 2000, Oyama, S., et al., 2010), we can deduce shoulder blade movement from one marginal position (depression + adduction + internal rotation of lower angle) toward an opposite marginal position (elevation + abduction + external rotation of lower angle). The first movement combination is connected with arm flexion, the second one with arm extension.

We can conclude on the base of foregoing information, that each joint has its typical movement pattern which consists of characteristic movement combination simultaneously around all joint axes. The pattern has flexion and
extension variants. In clinical praxis, we diagnose so called functional joint blockade exclusively in these directions. It means that the blockade develops only in directions of natural movements.

**PATTERN AND NOT PATTERN MUSCLES**

We concluded in previous chapters that each joint of human body uses during natural motion only some of all possible movement combinations around all axes. This statement enables a quite new view on skeletal muscles according to their functions. Some of them provide during their contractions a movement combination which corresponds exactly to a joint pattern. These muscles can be named either flexion or extension “pattern muscles”. Remaining muscles work in both patterns. It means that their movement combination consists of individual movements which belong partly to flexion and partly to extension patterns. The muscles can be named “not pattern muscles”.

We want now to apply the hypothesis on the same joints we described in previous chapters.

**The wrist**

In the previous chapter we derived flexion and extension patterns of the wrist on the base of clinical and biomechanical studies. The flexion pattern involves dorsal flexion + radial duction, the extension one palmar flexion and ulnar duction.

Skeletal muscles belonging functionally to the wrist are named carpal muscles. The following Table 1 introduces their names and functions.

We can now to compare muscle functions with flexion and extension patterns of the wrist. It is evident that flexor carpi ulnaris corresponds to extension pattern and extensores carpi radialis longus et brevis to flexion one. These muscles can be determined as pattern muscles of the wrist. Remaining two muscles belong to not pattern muscles.

**The ankle**

In previous text we derived flexion and extension movement patterns of the ankle from scientific information. Flexion pattern includes motion in directions of dorsal flexion + inversion, extension pattern in directions of plantar flexion + eversion. Similarly to previous joint, we will compare now the ankle motion patterns with function of some muscles moving the ankle (see following Table 2).

Comparison of muscle functions in the table with flexion and extension patterns of the ankle leads to the conclusion that tibialis anterior muscle represents flexion pattern muscle and peronei muscles and lateral gastrocnemius represent extension pattern muscles.

**The shoulder blade**

We described previously that the shoulder blade moves in three axial system and we deduced flexion (depression + adduction + lateral rotation of lower scapular angle) and extension (elevation + abduction + internal rotation of lower scapular angle) patterns of scapular motion.

Skeletal muscles insert to the trunk on one side and to the shoulder blade on the other. Their names and functions are summarized in following Table 3.

Likewise in foregoing joints we have to sort now the muscles according to their relation to flexion and extension movement patterns of the shoulder blade. We can conclude from this comparison that lower part of trapezius muscle and upper part of serratus anterior muscle belong to pattern muscles.

**HYPOTHETICAL PROPERTIES OF PATTERN AND NOT PATTERN MUSCLES**

One question is coming now. What is the difference between pattern and not pattern muscles?

The pattern muscles provide natural movements. That is why they have
dominant role in locomotion. Their hypertonus develops a set of signs which are typical for so called functional joint blockade. Pathological chains in locomotive apparatus consist of only just functional joint blockades. That is why the pattern muscles take part in the chaining and form pathological muscle slings. Furthermore, clinical experience shows that the pattern muscles make much more problems during therapeutic process than the others muscles.

Not pattern muscles work in both flexion and extension movement patterns. That is why we predict for them dominant role in joint stabilization. They protect a joint from destabilization and greater excursions.

CONCLUSION AND DISCUSSION
Conclusions of the paper may be formulated as follows:

1) Each skeletal muscle of human body provides in his joint movements around all axes available in the joint. Concurrently we have to respect the fact that different parts of large and flat muscles can have distinct functions.

This statement is supported by anatomical textbooks describing structure and function of skeletal muscles. But description of a movement is missing in some muscles. We can deduce this movement according to space position of the muscle to individual movement axes.

2) Each joint of human body has his characteristic motion pattern. The pattern has flexion and extension variant. It consists of movement combination simultaneously around all joint axes.

This hypothesis is supported by scientific literature introduced above in the text describing natural joint movements. Next literature data regard anatomical structure of articular surfaces predicting joint motion pattern. We introduce here some examples.

Elbow and forearm are anatomically two independent structures but they work like a one functional unit. There are two movement axes for providing flexion and extension in elbow joint and supination and pronation in proximal and distal radio – ulnar joints. During natural movements elbow extension is combined with forearm pronation (taking a food from table) and elbow flexion with forearm supination (bringing a food to mouth) (Buchanan, T. S., Rovai, G. P., Rymer, W. Z., 1989). This natural motion combination is predicted by a form of articular surfaces in trochlear humero – ulnar joint (Johnson, D., 2008). Movement between trochlea humeri and incissura ulnae is dictated by a leading crista. The crista does not form a ring but a slight spiral. That is why elbow extension is connected with ulnar pronation and elbow flexion with ulnar supination.

Knee joint moves around two joint axes. Two pairs of movements are possible provide in this articulation: flexion + extension and outer + inner rotations. During natural motion is flexion combined with outer and extension with inner rotation (Hirokawa, S. et al., 1992, More, R. C. et al., 1993, Aagaard, P. et al., 2000). Similarly like in previous joint, these natural knee joint patterns are predicted by anatomical structure. Femoral condyles are of different size. Their curvatures do not correspond also. There is why tibia must rotate during flexion and extension movements in the knee.

3) Skeletal muscles around each joint can be subdivided into pattern and not pattern muscles. The pattern muscles provide flexion or extension variant of joint motion pattern.

Hypothetically, they should be more active during movement than not pattern
muscles. We argued in previous point that knee joint flexion combines with external rotation and joint extension with internal rotation during natural movements. In this case, the pattern flexion muscles is biceps femoris and pattern extension muscle vastus medialis. It is supported for example by EMG studies on the knee joint (Schüldt et al., 1983). They recorded EMG activity in vastus medialis and lateralis, biceps femoris and semitendinosus/semimembranosus during rising exercise. They discovered that the vastus medialis is more active than vastus lateralis during extension and biceps femoris is more active than semitendinosus/semimembranosus during knee flexion.

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**Table 1: Muscles of the wrist and their function**

<table>
<thead>
<tr>
<th>Muscle name</th>
<th>Muscle function</th>
</tr>
</thead>
<tbody>
<tr>
<td>flexor carpi radialis</td>
<td>palmar flexion + radial duction</td>
</tr>
<tr>
<td>flexor carpi ulnaris</td>
<td>palmar flexion + ulnar duction</td>
</tr>
<tr>
<td>extensores carpi radialis longus et brevis</td>
<td>dorsal flexion + radial duction</td>
</tr>
<tr>
<td>extensor carpi ulnaris</td>
<td>dorsal duction + ulnar duction</td>
</tr>
</tbody>
</table>

**Table 2: Muscles of the ankle and their function**

<table>
<thead>
<tr>
<th>Muscle name</th>
<th>Muscle function</th>
</tr>
</thead>
<tbody>
<tr>
<td>tibialis anterior</td>
<td>dorsal flexion + inversion</td>
</tr>
<tr>
<td>tibialis posterior</td>
<td>plantar flexion + inversion</td>
</tr>
<tr>
<td>peronei longus et brevis</td>
<td>plantar flexion + eversion</td>
</tr>
<tr>
<td>gastrocnemius medialis</td>
<td>plantar flexion + inversion</td>
</tr>
<tr>
<td>gastrocnemius lateralis</td>
<td>plantar flexion + eversion</td>
</tr>
</tbody>
</table>

**Table 3: Muscles of the shoulder blade and their function**

<table>
<thead>
<tr>
<th>Muscle name</th>
<th>Muscle function</th>
</tr>
</thead>
<tbody>
<tr>
<td>levator scapulae</td>
<td>elevation + adduction + internal rotation of lower angle</td>
</tr>
<tr>
<td>rhomboideus minor</td>
<td>elevation + adduction + external rotation of lower angle</td>
</tr>
<tr>
<td>rhomboideus major</td>
<td>elevation + adduction + internal rotation of lower angle</td>
</tr>
<tr>
<td>trapezius – upper part</td>
<td>elevation + adduction + external rotation of lower angle</td>
</tr>
<tr>
<td>trapezius – lower part</td>
<td>depression + adduction + external rotation of lower angle</td>
</tr>
<tr>
<td>serratus anterior – upper part</td>
<td>elevation + abduction + internal rotation of lower angle</td>
</tr>
<tr>
<td>serratus anterior – lower part</td>
<td>depression + abduction + external rotation of lower angle</td>
</tr>
</tbody>
</table>

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ANALYSES OF BALANCE CHANGES IN ACTIVE SENIORS IN PRAGUE REGION: RESULTS OF TINETTI AND ANTHROPOMETRIC MEASUREMENT

Eliška FROŇKOVÁ, Jiří KAJZAR, Milada KREJČÍ, Martin HILL, Miroslav TICHÝ

Abstrakt
The submitted thesis was elaborated within the project GAČR ID 17-25710S „Basic research of changes in balance in seniors“. The author’s analysed the changes in the balance of seniors from the perspective of wellness and applied an intervention program in the locally active seniors in Prague. It reveals the close relationship between the psychic component and the balancing abilities of the elderly. The aim of the research, carried out in two selected facilities, was to analyses the changes in balance and its impact on senior research groups. Based on the evaluation of the data, it was found that the bio-psycho-social balance of seniors can positively influence balance abilities. The results confirmed the positive health and social benefits of the intervention program for the elderly. Seniors who are physically active show a high score in all the parameters presented in the presented results. Based on the data obtained, the author points out the importance and usefulness of quality intervention programs for the elderly.

Keywords
seniors, balance skills, intervention, bio-psycho-social components of balance, physical activities

INTRODUKTION
At the same time, the number of people with impaired ability to balance and the associated risk of falls, with health and economic consequences, is increasing. Health promotion is part of a ten-year “Europe 2020” program, which aims to improve the average healthy life expectancy of Europeans. The aim of the research was to focus on the issue of balance among seniors and to look at it in the context of life in a bio-psycho-social context. Body balance translates into a balance of movement, emotion and affects self-confidence and self-esteem. Non-equilibrium social relationships are reflected in the overall balance of seniors. The intervention program can positively affect the human balance and restore the natural defenses of the individual (Krejčí et al. 2016)

OBJECTIVE
To verify in practice the impact of the intervention program on the balance of seniors with respect to overall life satisfaction in the physical, emotional, psychological and social fields. Evaluate changes in the balance of seniors from the bio-psycho-social point of view.

HYPOTHESIS
The interventional motion program was applied twice a week for four weeks. The experimental group was tested before and after the application of the intervention program. Based on this procedure, the following hypothesis was established:

Hypothesis H1: After application of the intervention program, there will be a significant improvement in the Tinetti test results in the experimental group of seniors.

METHODS
Characteristics of the research sample
The experimental set was created by selection on the basis of an input
questionnaire, which were seniors, men and women who are physically active and were willing to cooperate in our research. The condition for entering our research was providing personal data. The experimental group consisted of 42 probands aged over 65, with an average age of 71, living in Prague, at home. Proband attended the lesson regularly twice a week in the morning. The control group consisted of 39 seniors who are physically inactive, with an average age of 81 years, living in Rakovník in the Home for the Elderly.

**Experimental sample (ES)**  
**Control sample (KS)**

**ORGANIZATION**

The intervention program was applied in 2018 for four weeks. The program was based on eight lessons of sixty minutes. The exercise units were regularly performed twice a week in the morning at the same time. The exercises were repeated, especially yoga exercises and relaxation with full yoga breath. These exercises were included in the preparatory and final parts. A group of seniors had to individually incorporate certain elements from each hour into their daily routine. In the control group, living in a retirement home in Rakovník, the intervention program was applied on the spot.

Diagnostic and anthropometric measurements were performed before and after the actual program, including a questionnaire survey in both groups of seniors. During the whole intervention program, information was obtained from seniors based on interviews and self-observation, which monitored the behavior of seniors during the program, their reaction to the program content, the personality of the trainer, the methods used.

**Assessment and diagnostic methods**

- **Functional anthropological examination:** It was created of selected classical anthropometry methods, which were non-invasive, using anthropometric instruments as anthropometer, digital personal scale, Harpenden calliper, manual dynamometer type Collin. Following parameters were examined: body height, body weight, BMI, girth of chest across mesosternale, girth of waist, abdominal circumference, gluteal circumference, arm circumference relaxed, calf circumference maximal, biepicondylar width of humerus, biepicondylar width of femur, width of wrist, width of ankle, girth of thigh, girth of knee, girth of ankle; thickness of 7 selected skinfolds - calliper measurement type Harpenden (biceps, triceps, suprailiac, abdominal, subscapular, anterior thigh, calf medial). Body Composition Analysis using In-Body 230. The methods in the Functional anthropological examination were provided according methodological description of Bláha (2017).

- **Tinetti Balance Assessment Tool** (Tinetti, Richman et al., 1990). The test was developed to examine the balance ability and gait ability in seniors. Some authors call it as the "Performance-Oriented Mobility Assessment" (Shumway-Cook, Woollacott, 2016). The total balance score consisted from the two components: static balance score and gait score. The Tinetti Balance Assessment Tool represents a very good test of a balance ability of seniors to evaluation of interventions. It has better test-retest, discriminative and predictive validities concerning fall risk than other tests including “Timed Up and Go test”, “One-leg stand” (Lin, Hwang, Hu et al 2000). During testing procedure seniors may use aids as sticks, crutch, if they use it in daily life. The test requires a hard armless chair, a stopwatch and also, a 15feet even and uniform walkway. The test has 2 sections; the first assesses static
balance abilities on a chair and also in standing, and the other assesses dynamic balance during the gait on a 15-feet long walkway. The patient is to sit in an armless chair and will be asked to rise up and stay standing. The patient will then turn 360° and then sit back down. Testing this, the evaluator will look at several key points including how does the patient rise from and sits down on his/her chair, whether or not the patient stays upright while sitting and standing, what happens when the patients' eyes are closed or when the patient gets a small push against the sternum. Next, the patient will have to walk at a normal speed, followed by turning and walking back at a “fast but safe” speed. The patient will then sit back down. As well as in the first part of the test, there are some points the evaluator has to look at. These are the length and height of the steps, the symmetry and continuity of the steps and straightness of the trunk. (Shumway-Cook, Woollacott 2016; Raîche, Hébert, Prince et al. 2000).

STATISTIC METHODS
Appropriate mathematical-statistical methods were used to evaluate the results. The data obtained from the questionnaires were processed on the basis of variation analysis, using the ANOVA software program, and response rates were obtained for individual files (for a scale of 1-5). The activity of seniors was chosen as the main predictor for the analysis of the results. Further, the analysis was performed for multiple sorting for measurement.

The obtained data showed a normal distribution, all tests and results are interpreted at the significance level, ie with 95% confidence. Tables and bar graphs were used to graph the results. In the case of a more detailed analysis of the PivotTable using statistical analysis, graphs showing row or column scores were used for a clear result dimension.

Statistically processed data were evaluated with respect to other findings, which came from the results of a questionnaire survey and subjective evaluation of the impact of exercise on the daily activities of seniors and their current physical and mental condition (Meloun, Hill, Militky, & Kupka, 2000).

INTERVENTION METHOD
The intervention program was based on simple exercises such as: stretching, strengthening and practicing balance exercises, including breathing and relaxation exercises. Experts agree on research findings on the possibility of influencing the mental state by a reflex way if we make some changes at the physical level. There are social changes, especially in interpersonal relationships. The four-week intensive program was chosen because of repeatedly confirmed effective health benefits (Barnett et al 2003, Sherrington et al 2004, Hendl, Good 2011; Šauerová, Vadíková et al 2013).

Increased attention was paid to supporting and maintaining balancing abilities. Exercises in lower positions (lying down, in a four position) are perceived as easier than exercising in higher positions, where keeping balance is more difficult. Each lesson had a certain motto that included specific physical, mental and social techniques and exercises throughout the week, and then in subsequent weekly cycles.

Content topics for each week:
Week 1 “You are never alone”
Week 2 “Change is always possible”
Week 3 “Movement is life”
Week 4 “Enjoy life and every moment”

The movement program itself was based in part on elements of yoga in daily life (Maheshwarananda, 2016) using exercises and positions aimed at developing coordination skills, especially
balance. Simple exercises were gradually combined into a simple exercise set. At the same time, emphasis was placed on proper breathing and careful exercise, taking into account individual motor skills and the current physical condition of seniors. At the same time, closed and open eyes were alternated to support the senses that affect movement control without visual control. All exercise positions have a positive effect on correct posture and strengthen the sense of balance.

RESULTS

Analysis of input and output data of experimental and control group
Here are tables showing the age variance of probands and the subsequent gender breakdown. All published test results are significant at p <0.05.

<table>
<thead>
<tr>
<th>Age</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Experimental</td>
<td>81</td>
</tr>
<tr>
<td>Women</td>
<td>16</td>
</tr>
<tr>
<td>Control</td>
<td>65</td>
</tr>
</tbody>
</table>

Tab. 1 Age (n=81, 16 men, 65 women; ES=42, 6 men, 36 women; KS=39, 10 men, 29 women)

Seniors of both the experimental and control groups underwent an InBody measurement before the intervention program began, and height and body weight were measured (Table 3). The mean weight was 73.3 kg in the experimental group and 77.7 kg in the control group. In men the mean weight was measured in the experimental group 86.6 kg, in the control group 73 kg.

BMI was measured in the experimental group on average 26.7, in the control groups 31.

When comparing the results in women, different results show the measurement of the amount of adipose tissue, the experimental group shows an average value of 37% (median 33%), the control group already 42.5% (median 41). A similar difference was seen in the average amount of muscle tissue, the experimental group showed 29.8 kg (median 31 kg), the control group only 25.5 kg (median 24 kg) (see Table 3).

Analysis of the results after application of the intervention program shows a positive change in the composition of muscle and adipose tissue. In Table 3, the ratio of muscle and adipose tissue in both women and men significantly changed after intervention. The experimental group of women did not show a statistically significant change. In women of the control group, the proportion of muscle mass increased by an average of 0.75 kg (median 1 kg), while the proportion of adipose tissue decreased by an average of 0.2% (median -1%).
### Analysis of anthropometric measurements

#### Tab. 2 Anthropometric analysis (n = 65, ES 36 women; KS 28 women)

We had similar results in men as in women. Table 5 shows the difference between baseline and baseline. After application of the intervention program, the proportion of muscle tissue increased on average by 0.7 kg (median 1). Adipose tissue decreased by 1 kg (median - 2). Statistically significant differences were in the male control group.

#### Tab. 3 Anthropometric analysis analysis (n = 16, ES 6, KS 10)

Table 4 shows the relationship of each variable to activity status. Obviously, physical activity plays an important role in anthropometric indicators. Statistical analysis showed a significant difference between the active (experimental) and passive (control) groups. BMI and muscle mass ratio were significant variables.
Evaluation results using the O2PLS method (the method of regression analysis using the orthogonal projection method for evaluating the relationships of variables among themselves, in our case it was a relationship of activity to other evaluated parameters. The results showed a significant effect of height and muscle mass.

<table>
<thead>
<tr>
<th>Variable</th>
<th>Predictors</th>
</tr>
</thead>
<tbody>
<tr>
<td>Height</td>
<td>0.513 **</td>
</tr>
<tr>
<td>Fat</td>
<td>0.443 **</td>
</tr>
<tr>
<td>Fat %</td>
<td>-0.243 *</td>
</tr>
<tr>
<td>BMI</td>
<td>-0.314 **</td>
</tr>
</tbody>
</table>

**Tab. 4 Results of relationship between activity status and individual variables (n = 81)**

Evaluation of balance and gait results according to Tinetti

The group of active seniors shows significantly better initial data evaluation in all parameters. The output data did not show statistically significant improvement in both groups. The evaluation in Table 5 shows significant differences between the experimental and control groups.

<table>
<thead>
<tr>
<th>Prediktor</th>
<th>R</th>
<th>t-statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tinetti Walk</td>
<td>0.93</td>
<td>10.72</td>
</tr>
<tr>
<td>Tinetti Score</td>
<td>0.631</td>
<td>5.78</td>
</tr>
</tbody>
</table>

**Tab. 5 Comparison of input data between control and experimental groups**
Seniors from the experimental group who had a better score at baseline did not have a significantly better score at baseline. Probably there was a significant improvement in balance and gait in probands who did not have an entry score as high and vice versa, a deterioration in the outcome of seniors who achieved the best results in the entry measurement. Taking into account the differences between the two groups, they could have approached each other and the result of the evaluation of the whole population did not change statistically. These results do not support the hypothesis H1.

**DISCUSSION**

Due to changes in body composition, muscle and fat content, BMI measurements are less reliable for the elderly. For the age over 65 years, the optimum BMI is considered to be in the range of 24-29, i.e. in the range of lightweight.

BMI alone does not indicate the cause of overweight, while a low value may indicate low muscle mass. This would partly elucidate the claim that mildly overweight seniors have a longer life expectancy, compared to the BMI indicating normal weight (Riboli et al., 2002). Especially regular physical activity prevents loss of muscle mass and development of sarcopenia. Increased prevalence (about 20%) of sarcopenia is often associated with a nutritional disorder and a higher percentage of body fat. Malnutrition is a frequent phenomenon among seniors and is linked to long-term institutionalization.

Further studies could evaluate the effects of appropriate nutritional interventions on the treatment and prevention of sarcopenia (Nasimi, 2019).

By comparing the results from anthropometric examination it is clear that the experimental group shows more favorable values from the health point of view compared to the control group. The intervention program has shown a significant effect on the favorable change in the ratio of adipose tissue and muscle mass in the control group, even such a short intervention program can have a positive effect on the structure of body composition. In the experimental group seniors showed optimal results at the beginning of the research, so it can be assumed that no significant change could have occurred. At the same time we cannot neglect the results of the initial examination in active seniors from the experimental group, where the previous physical activity proved to be an important factor affecting the ratio of muscle and fat tissue. Research confirms that even physically active seniors can achieve physical composition parameters similar to the general population.
By comparing the resulting difference in input and output data for both groups, we wanted to verify the change in the equilibrium level. We expected that the intervention program would disturb the balance of both groups in terms of improving the balance. The results showed a very significant difference in the input data when evaluating equilibrium, gait, and the sum of both parameters in favor of the experimental group. The output data did not show a statistically significant change.

In terms of statistical significance, it cannot be said that after the intervention program, the elderly groups would improve significantly in the area of physical balance. We could therefore argue that the intervention program did not have such a significant expected effect. During the program, we could observe positive changes in seniors during exercises aimed at improving balance skills. Seniors' own feelings that they are able to handle difficult exercises have also supported our expectations. The question remains, what is more important with regard to our research.

Based on observations in exercise units, we can see that there has been a shift in the seniors in terms of improving their balance, but these changes have not been statistically significant. The question remains, what is more important with regard to our research.

Gillespie (2012) confirms the impact of intervention exercise programs and home interventions on reducing the risk of falling in persons over 65 years of age.

CONCLUSION

The main objective was research into the balance of seniors and research into the effects of the intervention program on the balance of active seniors living in Prague at home.

Hypothesis H1: After application of the intervention program, there will be a significant improvement in the Tinetti test results in the experimental group of seniors, it has not been confirmed.

Although hypothesis 1 was not confirmed, after the intervention program both groups of seniors improved significantly in the area of physical balance. During the program, we could observe positive changes in seniors during exercises aimed at improving balance skills. Seniors' own feelings that they are able to handle difficult exercises have also supported our expectations. The question remains, what is more important with regard to our research.

Research findings show that the "Living in Balance" intervention program is also suitable for seniors living in nursing homes. The research has shown the health and social benefits of the intervention program.

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HOW YOGA PRACTICE TIME IMPACT THE LEVELS OF DEPRESSION, ANXIETY, STRESS AND POSITIVE AND NEGATIVE AFFECT AMONG HUNGARIAN YOGA PRACTITIONERS

Gusztáv József TORNÓCZKY, Miklós BÁNHIDI, Marie YOUNG, Henriett NAGY, Sándor RÓZSA

Abstrakt
Stress, anxiety and depression are closely linked; depression is the leading cause of disability in adults under the age of 45. In the EU, Hungary is the Member State with the largest share of population reporting depressive symptoms (10.5%). Coping with stress is an important element in maintaining a healthy lifestyle. Yoga is a commonly used tool among mind-body practices to cope with depression. The purpose of our study is to examine the correlation between time spent with yoga practice and the practitioner’s levels of depression, anxiety, stress, emotion regulation and positive and negative affect. Subjects were Hungarian yoga practitioners (N=555, 465 female), 18 years and older who filled the questionnaire between November 2015 and February 2016 nation-wide. Outcome Measures were the Depression Anxiety Stress Scales (DASS-21), Difficulties in Emotion Regulation Scale (DERS) and The Positive and Negative Affect Schedule (PANAS). The results revealed significant differences between Beginner, Intermediate and Expert Yoga groups. Experts had a lower level of depression and stress as Beginners and Intermediates. Positive affect was higher in Expert group as both other groups and Negative effect was the lowest in Expert group compared to the Intermediate and Beginner group. Based on the data of Hungarian yoga practitioners, it can be concluded that long-term yoga positively influences the practitioner's ability to cope with stress and can lead to a higher level of quality of life. Yoga could be recommended for healthy adults to manage stress and prevent depression and anxiety.

Keywords
Depression, Anxiety, Stress, Yoga, Positive and Negative affect

INTRODUCTION
Stress and stress-related disorders such as anxiety and depression are leading sources of disability worldwide for adults (WHO, 2001; Shyn & Hamilton, 2010; Ventriglio, Gentile, Baldessarini, & Bellomo, 2015). Anxiety is the strongest predictor of depressive symptoms (Mathew, Pettit, Lewinsohn, Seeley & Roberts, 2011). Depression could be the world’s leading health problem by 2020, the World Health Organization estimates, who reports that one in five people will experience depression at some time in their life (Marcus, Yasamy, Ommeren, Chisholm & Saxena, 2012). Stress, anxiety and depression are closely linked, exposure to chronic stress can have a cumulative effect on the body as an "allostatic load (AL)” (McEwen, 2003). Permanent injury or disability could be the result of an allostatic load when the chronic stress exceeds the physical and mental capacity of the individual to cope (Taylor, Goehler, Galper, Innes, & Bourguignon, 2010). If the sympathetic nervous system is overstimulated, it can lead to reduced coping capacity and poorer long-term physical and psychological health. Inborn susceptibilities and learned coping strategies are important factors on the ability of an individual to respond to the chronic stressors associated with
Coping with stress is vital to modern humanity to maintain mental and physical health. Mind-body interventions are commonly used to cope with depression and yoga is one of the most commonly used mind-body interventions (Cramer, Lauche, Langhorst & Dobos, 2013). Yoga is an important part of Eastern lifestyle and spiritual path that originated from India. The term originated from the Sanskrit word 'Yuj,' meaning unity/union (Feuerstein, 1998). Yoga can be considered as a connection with our true spiritual nature and the Supreme. On the other hand, yoga can be vital for aligning the body, mind, spirit and soul (Tornóczky, 2013). The yoga tradition has four paths (Sivananda, 2000): Karma Yoga (path of selfless action, service), Bhakti Yoga (path of devotion), Jnana Yoga (path of knowledge), and Dhyana Yoga (also known as Raja Yoga or Ashtanga yoga) - this yoga path is practiced today mainly in Western world yoga studios. Yoga as a mind-body practice includes elements of physical postures (asana), breathing techniques (pranayama), meditation (Dyana), and other practice (Iyengar, 1976). Yoga practice in the Western world increased its popularity by promoting physical and mental well-being (Cramer et al., 2016; Ding & Stamatakis, 2014) to members of society. Yoga practitioners usually perceive positive physical- and psychosocial changes and relatively few negative changes in their lives (Park, Riley & Braun, 2016) and yoga can be practiced cost-effectively and relatively safe. Yoga practices offer regular physical exercise which has a positive impact on the physical, mental and social health (Reed & Buck, 2009 Eime, Young, Harvey, Charity & Payne, 2013). Greater amounts of these activities are generally associated with reduced symptoms of depression (Dunn, Trivedi, & O'Neal, 2001). Research shows that the practicing yoga reduces the symptoms of perceived stress (West, Otte, Geher, Johnson & Mohr, 2004). It means yoga practice could be also a treatment for patients with depressive disorders and individuals with elevated levels of depression (Cramer, Lauche, Langhorst & Dobos, 2013) and anxiety (Butterfield, Schultz, Rasmussen & Proeve, 2017), and can reduce the stress of healthy adults (Chong, Tsunaka, Tsang, Chan & Cheung, 2011). The biological explanation of the positive effects of yoga practice could be that yoga can reduce the symptoms of depression and anxiety by its effect on the regulation of the sympathetic nervous system (SNS) and the hypothalamic-pituitary-adrenal (HPA axis) system (Pascoe & Bauer, 2015).

In the European Union, "6.8% of the adult population (18 years and over) report experiencing current depressive symptoms. 2.9% say their symptoms are major. Depression causes persistent sadness, a loss of interest in activities that you normally enjoy and an inability to carry out daily activities. The Member State with the largest share of population reporting depressive symptoms is Hungary (10.5%), followed by Portugal (10.4%) and Sweden (9.0%). These symptoms are less common in the Czech Republic (3.2%) and Slovakia (3.5%)" (Eurostat, 2017). Based on these facts, it is particularly important to recommend and learn methods that can help the Hungarian population prevent and treat depression. Testing the effects of yoga practice in Hungary on mental health can provide useful data for Hungarian people and health professionals.

**OBJECTIVE**

Our research is the first in Hungary with a national sized sample on these markers of mental health among Hungarian yoga practitioners. The objective of the present study was to investigate the correlation of different yoga practice time on the level of depression, anxiety, stress, emotion regulation and positive and negative
affect and also investigate the possible differences between genders in the examined parameters.

**MATERIALS AND METHODS**

**Participants**

In the research 562 yoga practitioners participated, 416 person completed an online 146 person paper-based questionnaire. We excluded from the survey those respondents, who evaluated their health status to be bad (5 persons) or they were under 18 years of age (2 persons).

In the sample 83.8% were females and 16.2% males. The distribution of age categories was quite large: 18 to 79 years (M=42.76, SD=11.93). Their educational background was 70.9% university degree, 29.3% secondary school. Their marital status was: 23.0% unmarried, 46.9%, married, 1.4% not living with spouse, 10.8% divorced, 3.0% widow, 15.0% living in a relationship.

Among the trials 73.1% were yoga practitioner and 26.9% yoga teacher. Years of yoga practice (without break): less than 1 month 5.0% (n=28), 2-6 months 13.7% (76), 7-12 months 9.0% (50), 1-2 years 19.1% (106), 3-5 years 23.6% (131), more than 5 years 29.5% (164). For further analysis, three yoga practice groups were examined based on years of yoga practice without break: Beginners 18.7% (n=104), intermediate 28.1% (n=156), experts 53.2% (n=295).

**Procedure**

Participants of our survey were recruited from all over the country by inviting emails to yoga studios, creating our website (www.jogakutatas.hu), official support from the Hungarian Association of Yoga Educators, and paper-based questionnaires at two yoga studios in Eastern part of Hungary, in Debrecen for the cross-sectional study between 2015 November and 2016 February. The questionnaire assessed socio-demographic data of yoga practitioners, their yoga practice characteristics, and health behaviours. Additionally, we examined in detail a variety of mental health characteristics, of which the present study focuses on (stress, anxiety, depression, emotion regulation, and positive and negative affect). The reliability of the measuring instruments was good for each questionnaire.

The Research Ethics Committee approved the research of the Faculty of Pedagogy and Psychology of Eötvös Loránd University with approval number 2015/224.

**Measures**

- **Depression Anxiety Stress Scales-21 (DASS; Lovibond & Lovibond, 1995a):** Developed by Australian researchers (Lovibond & Lovibond, 1995b) as an abbreviation from the original 42-item questionnaire. The questionnaire assesses three negative emotional states: depression, anxiety and stress, each with 7-7 questions. The authors of the self-characterizing questionnaire evaluate on a four-point Likert scale how much they agree with their content based on the experience of the past week. Categories on the Likert Scale: 0-3, where (0) Not at all characteristic of me; a (3) It was very remarkable to me or very often. The scale is used both in the normal population (da Silva et al., 2016; Willemsen, Markey, Declercq, & Vanheule, 2011) and in the clinical sample (Randall, Thomas, Whiting, & McGrath, 2017), translated the international questionnaire into the world. The results show that the questionnaire is reliable and has a high internal consistency (Antony, Bieling, Cox, Enns, & Swinson, 1998; Bottesi et al., 2015). The questionnaire is currently validated on a national sample.

- **Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004; Bjureberg et al., 2016):** The questionnaire contains 36 items that the filler must judge according to how often the statement is true. The filler must indicate on a five-point
likert scale how correct the statements are (1: almost never, 5: almost always). The model distinguishes six factors: (1) the unacceptability of emotional reactions, (2) difficulties in maintaining targeted behaviour, (3) impulse control difficulties, (4) lack of emotional awareness, (5) reduced access to emotional control strategies, and (6) lack of emotional purity. The statistical indicators of the questionnaire are also suitable for international and Hungarian samples (Gratz & Roemer, 2004; Kökönyei, Urbán, Reinhardt, Józan, & Demetrovics, 2014). The reliability and validity indicators of the questionnaire were tested on an American university student sample (N = 367; mean age: 23.10 (SD = 5.67); 73% increased). Each of the subscales showed adequate relativity (Cronbach α = 0.80 to = 0.89), the test retention was good (r = 0.88). The questionnaire has been translated and used in several European languages (Gomez-Simon, Penelo, & de la Osa, 2014; Medrano & Trogolo, 2014; Mitsopoulou, Kafetsios, Karademas, Papastefanakis, & Simos, 2013). A shortened version of the Emotion Control Difficulty questionnaire (DERS-16) was developed and validated by Bjureberg et al. (Bjureberg et al., 2016). The internal consistency of the short version was excellent (Cronbach α = 0.92) and the reliability of the test latch proved to be good ((ρl = 0.85; p <0.001). The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988): To explore the positive and negative emotional aspects, Watson et al. (1988) developed a measuring instrument consisting of 20 items. The method includes ten positive (e.g. enthusiastic, attentive, devoted) and ten negatives (e.g. distracted, irritable, tense) personality traits that the filler has to evaluate on a five-grade scale for himself. The evaluation can be based on several time intervals: e.g. right now, last week, last month, last year, or how you feel. In this research, we asked him about feelings about the last month. Cronbach-alpha indicators that estimate the reliability of different scales (state, trait, positive, and negative affinity) of the instrument vary from 0.85 to 0.90 based on the research results of those are developing the method (Watson et al., 1988). Factor analyses on the measuring instrument support the independence of the dimensions of positive and negative affinity. According to research results, the interaction between positive and negative affinity fluctuates between low, -0.12 and 0.25 (Chen, Dai, Specter, & Jex, 1997; Joiner & Blalock, 1995; Mehrabian, 1998; Watson et al., 1988). The questionnaire has been translated into many languages of the world, and the results confirm the reliability and reliability of the questionnaire (de Carvalho et al., 2013; Merz et al., 2013; Terracciano, McRae & Costa, 2003). Sándor Rózsa and Natasa Kő made the translation and validation of the Hungarian version. The psychometric indicators of the Hungarian questionnaire also correspond to the international results (Rózsa et al., 2008).

Statistical Analyses

Descriptive statistics (Mean, SD, Frequencies) were reported in the text. Examining the difference between yoga practice time groups in the measurements (depression, anxiety, stress; emotional regulation; positive and negative affect) 3x2 factorial ANCOVA was used. In this model, independent variables were the following: 3 (yoga practice time groups: beginner, intermediate, experts) x 2 (gender: female, male), age was used as a covariate. Covariate (age) in models appearing at the following value: 42.76 years. Bonferroni post-hoc tests were conducted as follow-up tests.

Statistical analyses were performed using IBM SPSS Statistics for Windows, v25.0 (IBM Corp. Released 2017 Armonk, NY: IBM Corp.). In statistical analyses, the fixed level of significance was p = 0.05.
RESULTS AND DISCUSSION

Depression, Anxiety and Stress (DASS)

In the case of DASS total and subscales of Depression, Anxiety and Stress, the main effect of gender and the interaction effect of Gender x Yoga practice time were non-significant. Total score and the three subscales yielded a significant Yoga practice time main effect, indicating significant differences between Beginner, Intermediate and Expert (Table 1.). Based on the Bonferroni post-hoc test, Expert group showed lower scores than Beginner group and Intermediate group revealed in-between scores in DASS total and Depression and Stress subscales. After considering the Anxiety subscale, the data showed that there are no significant pairwise comparisons (Figure 1.).

Table 1. The main effect of Gender, Yoga practice time and Gender x Yoga practice time (ANCOVA) in the scales of DASS, DERS and PANAS

<table>
<thead>
<tr>
<th></th>
<th>Gender</th>
<th>Yoga practice time</th>
<th>Gender x Practice time</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>F</td>
<td>p</td>
<td>η²p</td>
</tr>
<tr>
<td>DASS total</td>
<td>0.341</td>
<td>0.560</td>
<td>0.00</td>
</tr>
<tr>
<td>DASS depression</td>
<td>2.647</td>
<td>0.104</td>
<td>0.01</td>
</tr>
<tr>
<td>DASS anxiety</td>
<td>0.672</td>
<td>0.413</td>
<td>0.00</td>
</tr>
<tr>
<td>DASS stress</td>
<td>0.491</td>
<td>0.484</td>
<td>0.00</td>
</tr>
<tr>
<td>DERS total</td>
<td>0.565</td>
<td>0.453</td>
<td>0.00</td>
</tr>
<tr>
<td>PANAS positive affect</td>
<td>7.233</td>
<td>0.007</td>
<td>0.01</td>
</tr>
<tr>
<td>PANAS negative affect</td>
<td>2.716</td>
<td>0.100</td>
<td>0.01</td>
</tr>
</tbody>
</table>

Figure 1. Differences between Beginner, Intermediate and Expert yoga groups

Emotional Regulation (DERS)

All effects were statistically non-significant at the .05 significance level (Table 1.). It is worth to mention that Expert group (M=31.84, SD=10.57) showed a comparatively lower score than
Beginner group (M=37.47, SD=11.59), the mean score in the Intermediate group was 33.66 (SD=9.88). s

**Positive and Negative Affect (PANAS)**

Examining the Positive Affect, the Gender main effect was significant, indicating significant differences between males (M=35.15, SD=5.98) and females (M=36.89, SD=6.10). The main effect of Yoga practice time was also significant such that Positive Affect was significantly higher for Expert group (M=37.2, SD=5.99) than for Beginner group (M=34.94, SD=6.67), and Intermediate group (M=36.62, SD=5.77) showed in-between score. Gender x Yoga practice time interaction was non-significant (Table 1.).

In the case of Negative Affect, the main effect of gender was not significant. The main effect of Yoga practice time yielded significant differences between Yoga practice time groups. Expert group (M=15.88, SD=5.69) showed a lower score than Intermediate group (M=17.7, SD=6.12) and Beginner group (M=19.77, SD=7.1) showed the highest score (Table 1.). The interaction effect was significant, revealing that the difference between males and females could not be experienced in Expert group while this difference was identified in Beginner and Intermediate group (females showed a higher score than males) (Figure 2.).

**Figure 2. Gender x Yoga practice time in PANAS negative**

![Graph showing Gender x Yoga practice time in PANAS negative](image)

**DISCUSSION**

Our results showed that there is a correlation between yoga practice time and depression, anxiety, stress, negative affect and positive affect among yoga practitioners. Both male and female sample showed that long-time practiced yoga seems to have positive results on the level of depression, anxiety and stress, and also positively impact the positive and negative affect of the practitioners.

Our findings confirm that yoga practice reduces the value of the practitioners levels of stress and depression and it is concurrent with
literature based on clinical sample (Cramer, Lauche, Langhorst & Dobos, 2013; Saeed, Antonacci & Bloch, 2010) and healthy adults (Chong, Tsunaka, Tsang, Chan & Cheung, 2011).

Our results stated too that yoga practice has the potential to reduce the somatization score and scores related to mental health indicators, such as anxiety, depression, anger, and fatigue, like in a 12-week yoga training program in Japan. Their findings suggest that yoga has implications for the prevention of psychosomatic symptoms in healthy women (Yoshihara, Hiramoto, Oka, Kubo & Sudo, 2014).

Also in the national survey from the United States showed that stress relief is one of the primary reasons among motivations to adopting and maintaining yoga and depression/anxiety relief is among the other reasons (Ross, Friedmann, Bevans & Thomas, 2013). Yoga practitioners in Australia reported similarly that stress and anxiety management is a more important reason for practice as back, neck or shoulder problems suggesting that mental health may be the primary health-related motivation for practicing yoga (Penman, Cohen, Stevens & Jackson, 2012). One hand, it can be seen that literature reviews and original articles verify the positive effects of yoga exercise on depression, anxiety and stress and the other hand the practical experiences of yoga practitioners themselves are a sign of the effectiveness of practice.

Our research has shown that long-term yoga provides stable positive effects on these markers of psychological health as it can be seen according to the findings of international research (Yoshihara, Hiramoto, Sudo & Kubo, 2011; Ross, Friedmann, Bevans & Thomas, 2013).

In our survey we recognized also some limitations to testify the stress anxiety relieving benefits of yoga similar to other studies (Li & Goldsmith, 2012). The difference between the benefits of female and male practitioners are significant at the beginners, but at the experts it is no longer typical.

We agree on the opinions of other researchers, that further data collection is needed for further comparisons (Pucsok et al., 2018). According to experiences and results yoga practice can serve as a useful tool for treatment of patients with stress, anxiety, and depression symptoms.

CONCLUSION

Yoga practice is recommended for healthy adults to manage stress and prevent depression and anxiety. Long-term yoga positively influences the practitioner's ability to cope with stress and can lead to a higher level of quality of life. Given the high proportion of the population in Hungary suffering from depression, it is particularly worthwhile to recommend and promote mind-body methods such as yoga to treat and prevent these symptoms.

ACKNOWLEDGEMENT

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CANCER PATIENTS’ AWARENESS OF THE IMPORTANCE OF PHYSICAL ACTIVITY IN TREATING THEIR DISORDERS

Zuzana KÜCHELOVÁ, Alena BU KOVÁ, Ján JUNGER, Ladislav KRUČANICA

Abstrakt
The further the more attention is paid to the importance of physical activity in cancer patients. In recent years, we have seen a rapid increase in the number of patients having been cured successfully thanks to improved cancer screening, detection and treatment methods. There have been various studies on the effect of exercise as an effective way to prevent and improve the effects of cancer treatment. Given the severity of the disease, physicians and physiotherapists are very thoroughful, and the recommendations are more patient-specific and focused on the particular diagnosis. Objective: To get acquainted with the fulfillment of recommendations for performing physical activities by cancer patients.

Methods: The study group consisted of 102 patients diagnosed with some of the oncological diseases. One of the important criteria for inclusion in the study was the fact that the diagnosis did not prevent performance of physical activity. To obtain the research data we used the questionnaire method.

Results: Patients involved in our study, in the prevention and treatment of their health problems, put particular emphasis on regular medical check-ups and nutrition and eating habits. In terms of priorities, physical activity is only ranking fourth in this respect. The vast majority of patients involved in the study had been informed about the importance of purposeful physical activity by physicians; however, nearly half of the patients admitted that they had never talked to the attending physician about recommendations for physical activity. The most common activities that patients undertake are domestic chores and walks.

Conclusions: The data obtained suggest that some patients are not sufficiently physically active, a number of them are not even aware of the role and importance of physical activity in the treatment of their disease. There are even patients who do not consider such information relevant. This study was supported by Grant project 1/0825/17 "Recommendations for physical activities in prevention and control of non-communicable diseases and their implementation in the eastern part of Slovakia" implemented at P.J. Šafárik University in Košice.

Keywords

INTRODUCTION
It is estimated that regular physical activity (PA) may reduce premature mortality rate in populations at risk by 20% (Buková et al., 2019). Since the times of Sigmund Freud, many experts have been treating mental and social aspects of chronic diseases and not only medical conditions. In addition, they have been also promoting a healthy lifestyle among risk populations (Adam et al., 2019). Currently, patients suffering from invasive cancer can exceed the five year survival rate due to new therapeutic procedures and early diagnosis. Moreover, the number of such patients is continuously rising. Many patients are experiencing mental problems after their treatment ends. Although such problems are not regarded as clinically significant, they considerably influence life quality.

The leading cause of deaths in the EU and other developed countries worldwide are cardiovascular diseases.
(Go et al., 2013; WHO 2014). The second most common cause of death is cancer (Moyad, 2016). The studies published on the prevention of cardiovascular diseases focus mainly on lifestyle and dietary changes, nonetheless such information may apply to cancer prevention as well. Overweight and obesity may also contribute to the high rate of cancer incidence and mortality (Lippman et al., 2009; Rossouw 2002; Wagenlehner, Weidner 2009). The results of the Canadian Heart Health Surveys (1986-1995) demonstrate significant association between BMI and mortality from all causes, CVD and cancer (Katzmarzyk 2012). It is believed that kidney stones and renal cell carcinoma strongly correlate to obesity as well (Taylor 2012; Moyad 2001; Mathew 2009).

According to Forman et al. (2014), breast cancer is a leading cause of cancer-related deaths in women. More than half of the cases are occurring in developed countries. Anderson et al. (2014) claim that breast cancer is the most common diagnosed cancer and the second most common cause of death in Great Britain. According to Kellen et all (2008), the incidence of breast cancer in Eastern Europe is somewhat low, but it is high in South America, South Africa and Western Asia. Torre et al. (2016) claim the highest incidence in Western Europe and the USA and the lowest in Africa and Asia. The incidence of breast cancer in developing countries is rapidly increasing (Balneaves et al, 2014). In developed countries, about 1 in 8 women will develop breast cancer over the course of her lifetime. In Europe, there is a breast cancer diagnosis every 2 minutes and a death due to breast cancer every 6 minutes (Balogun, Formenti, 2015). There are almost 1.7 million cases diagnosed per year and more than half a million deaths every year.

More attention is paid to the importance of physical activity in cancer patients. In recent years, we have seen a rapid increase in the number of patients having been cured successfully thanks to improved cancer screening, detection and treatment methods. There have been various studies on the effect of exercise as an effective way to prevent and improve the effects of cancer treatment. Given the severity of the disease, physicians and physiotherapists are very thorough, and the recommendations are more patient-specific and focused on the particular diagnosis. Such recommendations must be clear, meaningful and applicable. PA may help patients to increase lean muscle mass and maintain body weight. It also reduces sarcopenia, increases the sense of satisfaction and decreases belly fat storage (Poehlman, Melby 1998; Braith, Stewart 2006).

Physical activity has overwhelmingly beneficial effects – it reduces the risk of heart diseases, breast cancer, colon cancer and others (Moyad 2009). Regular physical activity provides many health benefits and is recognized as primary prevention and adjuvant treatment. Some studies also suggest that regular PA and exercise have protective and preventive effects (Goh 2012; Caspersen 1985; Woods 2000). It also develops physical and health condition (Platz et al., 2000, Trichopoulou, 2003). Furthermore, it improves the quality of life and reduces fatigue during and after treatment (Schmidt 2010). PA is also associated with a reduced risk of relapse or death. Of the six cohort studies conducted by ACSM specialists, four demonstrated the protective effect of PA with regard to breast cancer survival (Schmidt 2011) by inducing the cancer-suppressing phenotype TAMs (Goh, 2012). PA also includes activities such as housework, gardening, cycling, commuting, dancing, and others. It is a planned, structured, and repeated action to improve or maintain overall fitness.
PURPOSE
This study aimed to obtain information necessary to assess the level of implementation of the PA related recommendations given to cancer patients in eastern Slovakia.

MATERIALS AND METHODS
The research sample in this study comprised of 102 adult cancer patients (25 males, 77 females, average age; 61.86), who were being treated at 9 oncology outpatient clinics. Thirty-one individuals refused to participate in the survey. Seventy-eight subjects were urban residents and twenty-three were rural residents. The most important condition to participate in the survey was that the disease did not prevent physical activity. The largest subgroup consisted of breast cancer patients (66%). The other subgroups were limited in the number of subjects. Tab 1. presents basic sociodemographic indicators of the cancer patients in the survey.

This study followed a wider study which was conducted from 10/2018 to 2/2019 at outpatient clinics in eastern Slovakia and involved patients of 19 cardiology, 14 metabolic, and 9 oncology clinics. We randomly addressed 1,193 adult patients treated in these clinics, of whom 282 refused to participate in the survey. We further excluded another 18 patients for not meeting one or more of the essential criteria listed below. The criteria for participating in this research were met by 893 patients - 353 males (38.6%) and 540 females (61.4%). Among all participants, 8.29% patients acknowledged more than one chronic disease. The largest group consisted of patients with metabolic diseases (n=407), and patients with cardiovascular disease (n=384). The smallest group consisted of cancer patients.

Patients were enrolled in the research at meeting the criteria below:
- over 20 years of age
- the occurrence of one or more diagnoses of three underlying diseases of affluence that do not prevent physical activity (cardiovascular disease, oncological disease, metabolic disease)
- diagnosis having been treated by a specialist for a minimum of 1 year
- willingness to give informed consent to participate in the research
- willingness to fill in questionnaires regarding physical activity and be provided information about physical activity for a given diagnosis.

Data collection
For the data collection we used a non-standardized questionnaire, which was part of a questionnaire battery designed for our research purposes. Most of the questions used were selected from
previously validated or tested instruments, such as the Behavioral Risk Factor Surveillance System developed by the Centre for Disease Control and Prevention [6], or the International Physical Activity Questionnaire [10]. The questionnaire contained 29 questions and was designed for total completion time of 20 minutes. Most questions were closed-ended, with the option for respondents to elaborate on a certain response and were of a factual nature. The first seven questions focused on sociodemographic indicators, 4 questions covered patients’ medical condition and awareness of their medical condition, 14 questions dealt with PA (including short version of IPAQ) and awareness of PA, and 4 questions focused on the selected lifestyle factors.

In this papers we present results from the following items:

- What is the key component in the prevention and treatment of your health problems? (multiple choice)
- Have you ever been informed by your doctor or medical staff on the importance of physical activity in the prevention and treatment of your health problem?
- Have you ever been recommended any physical activity by your doctor?
- Type of physical activity you are mostly engaged in (multiple choice).
- If active, what physical activity do you perform?
- If active, how often do you perform physical activity?
- Daily duration of your physical activity (multiple choice).

Statistical Analyses

Statistical data processing was performed using IBM SPSS version 23 (Reference: IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY). Pearson's Chi Square Test was used to determine the differences in the actual frequency of the occurrence of attributes. Since too many comparison categories do not allow reliable interpretation, $\chi^2$ was calculated from dichotomized responses. Statistical hypothesis testing was performed at the significance level $\alpha<0.05$. The results were stratified by the disease groups and by gender.

This study was supported by Grant project 1/0825/17 “Recommendations for physical activities in prevention and control of non-communicable diseases and their implementation in the eastern part of Slovakia” implemented at P.J. Šafárik University in Košice. The research was approved by the UPJŠ Ethics Committee (PJSU-1/0825/17).

RESULTS AND DISCUSSION

Cancer is recognized as a family disease" (Vorlíček in Adam et al., 2019, pp. 25). Cancer patients need strong support to better daily functioning. Debilitating symptoms that onset with cancer treatment may result in patients experiencing anxiety, anger, and hopelessness. They often ask: "Can I do anything to prevent cancer recurrence?", "Can I do anything to beat cancer?". We were not surprised when we found that a regular doctor checkup was the most important treatment aspect for more than 60% of respondents. In this particular survey item, respondents could have selected one out of three options or additional option “others” where they could have elaborated on what was the most important factor for improving their medical condition. A healthy lifestyle is the most important factor for 59% of respondents. Sleep, rest and regular physical activity scored evenly (46% - 47%). It was interesting to find that our respondents considered medications to be the least significant factor in cancer treatment. The difference between medications and other factors was statistically significant ($p \leq 0.05$). We recorded no statistical significance in comparing the first four answers.
Many cancer patients in treatment or remission reported that PA had become their new passion. Sport may be as effective as an antidepressant, improve immunity and reduce pathological fatigue (Janíková et al. 2012; Hadrabová, Janíková 2018). The most favourable activity was walking (68.6%). Almost 64% of subjects preferred household work or gardening (Fig.2). Aerobic activities (activities – running, cycling, aerobic) was regularly performed by 22% of patients. We found a statistically significant difference between the first two responses at $\alpha = 0.05$.

Most patients were informed about the importance of PA by their doctor or nursing staff (Fig.2). The largest group (38%) only obtained general information. Nearly 27% of patients had never been informed by their physicians nor they had recognized the importance of PA in the treatment of their disease. The frequency match test revealed statistically significant differences in almost all responses except for differences between the following responses: yes, but I do not consider it important: I am not interested in information: no, but I am interested in information: I am not interested in the information.

The fact that cancer patients are only obtained general information may be due to the overuse of out-patient services, as well as a lack of doctors and nursing staff (McKenna, 1998). Large numbers of waiting patients often prevent doctors from engaging in preventive measures other than primary care. This issue concerns most specialized centres for oncological diseases as well as centres for chronic diseases in Slovakia. Another reason might be found in the doctor’s approach. Several studies suggest that the doctors, who are personally engaged in physical activity, acknowledge the importance of PA prescriptions.
Valuable insight was gained from assessing doctor’s recommendations on PA and meeting of such recommendations by patients (Fig. 4). In the group of patients who were informed about the importance of PA, only 21% followed the guidelines regularly. 27% of respondents admitted being informed, but their passivity prevented them to meet the recommendations. Nearly half of the patients admitted that they had never spoken to their specialist about this.

Several patients (6%) were even warned not to take part in physical activity as a treatment of their condition. The significance match test revealed significant differences between all responses (p ≤ 0.05) except for the association between yes, regularly: yes, but I don't feel like.

National Health and Nutrition Examination Survey (NHANES) recommends seven guidelines for a healthy lifestyle and the prevention of deaths from major diseases (Yang et al. 2012). The key component of a healthy lifestyle is daily physical activity. Only 18% of respondents in our survey met this recommendation (Fig. 5). 16% performed physical activity 3 to 4 times a week. However, most patients do not perform PA regularly or at all (53%) despite the fact that household work, gardening, and walks were also included in the PA category. The differences in PA participation frequency were significant (p ≤ 0.05), except for the differences between PA 1x: 2x weekly, 4x: 1x weekly and 4x: 2x weekly.
Platz et al. (2000) found that female cancer patients with a healthy weight, who completed 30 minutes of physical activity daily, were in the lower risk of overall mortality compared to inactive females (Trichopoulou et al., 2003). Each type of physical activity should match the individual needs of patients (DeNysschen et al., 2013). Irwin et al. (2015) and Nyrop et al. (2014) found that breast cancer patients, who were performing regular 150 min aerobic activities (brisk walks, cycling, etc.) for three months had significantly improved their health condition. Furthermore, the progress and symptoms of the disease mitigated after one year of regular PA. Lorinzi et al., (2012), Chen et al., (2011), Braith et al., (1998) suggest that 30 to 60 min of PA daily should be sufficient to maintain healthy weight, mental and physical health and reduce the risk of cancer, relapse, and mortality.

This recommendation was met by 37% of cancer patients in our survey (duration 30-45 min + 45-60 min) (Fig.6). More than 21% performed PA for 60 min and more. 14% of patients were physically active for less than 10 min.

In four cases, a frequency match found the differences between the variables (20-30min: 45-60min; 45-60:=>120 min; 90-120min: 45-60min; 60-90min: 45-60min). In the remaining cases, the difference between the individual variables was not confirmed (p ≤ 0.05).
CONCLUSION

In our research, a majority of cancer patients regard regular medical check-ups as well as nutritional and eating habits as key elements in the prevention and treatment of their health issues. Physical activity ranked third. Most patients were informed by doctors about the importance of PA during the treatment period. More than half of the patients though did not take part in PA or only occasionally. About one-third of the respondents followed the doctors’ recommendations. The most common physical activities of the respondents were walking and housework.

The collected data demonstrates that many cancer patients do not engage in PA regularly. There were patients who were never informed about the significance of PA during their illness and convalescence. A small group of individuals was not interested in being informed about PA at all.

Although physical activity along with standard health care for cancer patients may improve their quality of life, mainly, physical functioning, depression, and fatigue, according to Knips (2019) there is no convincing evidence for cancer patients that PA would improve their quality of life, physical functioning or anxiety.

Many patients spend more time performing physical activities during their illness than before it. They subconsciously realize that PA removes pathological fatigue, brings the feeling of joy and feelings they own their health, while at the same time it helps improve physical condition and accelerates recovery. Similarly, PA reduces the extent of fatigue and depression that often brings the treatment itself. (Marker et al. 2018; Persoon et al. 2017; Moore et al. 2016; Janíková et al. 2012; Pan, Morrison 2011, show positive effects of PA not only in relation to cardio-respiratory conditions but also in connection to flexibility, strength or vegetative balance of cancer patients. Patients conducting sports activities display a longer period of entering into relapse than the average population. Wiskemann et al. (2015) recommends regular PA for cancer patients to increase the survival rate. Nonetheless, Wiskemann et al. emphasize that each recommendation must be formulated cautiously in relation to the patient’s diagnosis.

In this study, breast cancer was the most frequent type of cancer among the participants (66%). Based on available literature, the authors Ha et al., (2007), Caan, et al. (2005), a Ballard-Barbash a McTiernan (2007) propose a multi-disciplinary approach to breast cancer. It should comprise of physical activity, control of body weight, high intake of fruits and vegetables, and modest fat intake. The results of WHEL (Pierce et al., 2002, 2007) study confirm that a healthy lifestyle, which includes high consumption of fruits and vegetables, maintains low body weight and physical activity provides increase the survival rate (Pierce et al., 2007, Cardoso, 2019). Regular exercise is a relatively simple and effective recommendation, which should be given to all breast cancer patients (Mustian, 2017). Anderson et al. (2014) estimate that the occurrence of this illness could decline by 42% if patients increased their PA, reduced their body fats and cut down on the amount of alcohol.

Despite the fact that the above-mentioned authors showed convincing arguments and knowledge of the PA benefits in the treatment of cancer patients, we are of the opinion that PA fails to draw appropriate attention. The human body is predetermined to activity and a non-active lifestyle is a risk factor for the emergence of many illnesses,
including ODs. Our main goal was to draw attention to this issue and extend knowledge about the importance of PA as a means for convalescence during treatment.

Acknowledgement:

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BALANCE ABILITY IMPROVEMENT OF SENIORS 65+ DURING THE SPA STAY

Radek NÁPRSTEK, Milada KREJČÍ, Jiří KAJZAR, Martin HILL

Abstrakt
The study was elaborated within the project GAČR ID 17-25710S „Basic research of balance changes in seniors“. The aim of the study was to verify the feasibility of the intervention program “Life in Balance” in the conditions of a spa stay in Jupiter Bechyně Spa for seniors 65+ and to prove that the spa environment poskytuje vhodné podmínky pro rozvoj a podporu rovnováhy seniorů 65+ jako součást léčby. Twenty participants (16 females, 4 males) in the age interval of 65 to 77 years old, attending comprehensive spa care, underwent the balance intervention as a part of their spa care. The following diagnostic methods were used: Medical Anamnesis, Functional anthropological examination; Tinetti Balance Assessment Tool, Short Form Health Survey (SF-36), the scale “Anamnestic Self-Assessment”. The Tinetti dynamic balance score as well as the Tinetti overall balance score of the participants improved significantly after the intervention. The intervention method “Life in Balance” can be implemented into the spa program of seniors 65+. It can influence significantly the overall balance ability. The spa environment is a very suitable place for such an intervention and it is possible to recommend the intervention program “Life in Balance” as a part of the spa medical rehabilitation care.

Keywords

Acknowledgement: Research was supported and funded by the Czech Science Foundation – project GAČR ID 17-25710S “Basic research of balance changes in seniors”.

INTRODUSTION
The European spa tradition is based on antique ancient traditions. Since the end of 19th century and in 20th century spa involves using of natural healing resources with a significant share of direct medical care and with a comprehensive approach to clients' medical stays. In the Czech Republic after 1989, the standard offer of spa therapeutic stays was extended to include new forms of relaxation and regeneration, which offer an individual approach with regard to the needs of seniors, when the term “senior” is defined as a person aged sixty and older, with defined pension, social security and healthcare rights (Jandová, 2009; Jandová et al. 2018; EU, 2016). In the elderly, postural control generally decreases and the balance skills of seniors decline (Benzo, Novotny, Karpman, Depew, 2013; Buso, et al., 2019; Shumway-Cook & Woollacott, 2016). Disruption of the static and dynamic balance can result in reduced physical activity in the seniors’ daily life. Decreased ability to balance is also a major risk factor for falls (Bukova et al., 2019). Fear of falling can lead to anxiety and reduce the activities of seniors. Seniors are thus becoming socially isolated (Dellinger, 2017; Gilleard, Higgs, 2005). According to the survey of the Institute of Health Information and Statistics, diseases of the locomotive and nervous system are the most frequently treated problem in spa resorts and facilities in the Czech Republic (CSU, 2019).

Interventions for seniors focused on balance development in the spa environment, based on appropriate and individual selection of exercises and techniques, can significantly influence the course of spa treatment and consequently significantly affect the quality of life of seniors (Jandová et al., 2018). Undoubtedly, physical activity is the
effective middle of preventing health deterioration due to aging. Twelve-week training in male seniors restored muscle steroid levels of DHEA, free testosterone and 5α-dihydrotestosterone, and also led to increased expression of steroidogenesis enzyme proteins. In younger participants, this training did not induce such changes (Sato and Iemitsu 2018).

One of the adequate movement activity for seniors balance support may represent yoga. Yoga exercises are slowly provided, with breathing improvement. Yoga includes effective physical and relaxation techniques for seniors used to achieve a state of inner balance and to create a feeling of well-being and freshness. Yoga exercises counterbalance muscle imbalances and ensure adequate exercise load for the musculoskeletal system. Breathing, relaxation and balance exercises establish balance of movement control, soothe the nervous system, and promote overall psycho-hygiene of elderly (Maheshwarananda, 2000; Kinser, Goehler, & Taylor, 2012; Cramer, Ward, Steel, Lauche, Dobos, et al 2016; ). The authors state that regular yoga exercises can restore and maintain general endocrine functions in the human body. A study conducted with 45 untrained volunteers who were divided by in the experimental group (with exercise: n = 23, 15 males - age 42.80 ± 7.43 years; 8 females - age 44.75 ± 8.40 years) and control group (no exercise: n = 22, 15 males - age 41.67 ± 7.87 years; 7 females - 45.43 ± 7.00 years). The experimental group underwent combined yoga exercises daily in the morning time for 12 weeks while the control group continued its usual activities. After 12 weeks of yoga training, there was a significant increase in growth hormone (GH) and dehydroepiandrosterone sulfate (DHEAS) levels in both sexes compared to their baseline data, whereas no significant changes were observed in the control group. This means that physical activity can lead to the maintenance of a baseline level of GH and DHEAS in the human body and thus healthy aging (Chatterjee, Mondal 2014; Cramer, Lauche, Langhorst, Dobos, 2013).

A hypothetical possibility represents the combination of physical activity in seniors with DHEA application. For example, this approach led to a decrease in fasting blood glucose levels in obese laboratory animals by activating the glucose metabolic signal pathway. In addition, during that the lipid metabolism in the muscles was intensified. Application of DHEA or testosterone also improves muscle protein synthesis and leads to increased muscle mass and strength in seniors and in type 2 diabetics. Increased levels of sex steroid hormones induced by DHEA applications have a number of benefits, but only in individuals with lower levels of sex steroid hormones such as the elderly, obese and type 2 diabetes patients. The combination of DHEA application and physical training then significantly it should lead to increasing of muscle sex steroid hormone levels, and to decreasing of the insulin resistance while increasing muscle mass and strength. Thus, application of DHEA in combination with exercise program may be one of the new therapeutic approaches for the treatment of obesity, type 2 diabetes and sarcopenia (Sato and Iemitsu 2018). It is possible to assume. For the development of balance in senior age, yoga exercises represent the perfect wide range of different movement situations that combine the physical and psychosocial attributes of balance, such as synchronization of movement with breathing, slowed movement sequences, and releasing the mind from fear and worry (Maheshwarananda 2000, Krejci, Kornatovska 2017, Montepare, 2019). In this context, yoga exercises can also help in psychosocial determinants of balance, such as improving concentration ability, emotional stability, ability to adapt to social change and new social situations.
OBJECTIVES, HYPOTHESES

The main objective of the presented study was to verify the feasibility of the interventional wellness program “Life in Balance” in the conditions of a spa stay in Jupiter Bechyně Spa for seniors 65+ as a part of the project “Basic research of balance changes in seniors”. ID 17-25710S. Another objective was to analyze and interpret the results of the holistic balance improvement in monitored seniors during the spa rehabilitation care, and to prove that it is the spa environment and spa treatment that creates the right conditions for the realization of the balance intervention as a part of treatment.

Hypotheses

H1: After completing the intervention “Live in Balance”, the overall Tinetti balance score will improve in the experimental group of seniors.

H2: After completing the intervention “Live in Balance”, the mental balance score will improve in the experimental group of seniors.

METHODS

Participants

The research study included in total 20 spa clients in senior age, who completed the intervention program during their comprehensive therapeutic rehabilitation spa treatment, lasting 28 days. The research sample included 14 women and 6 men in the age interval 65 - 77 years. The mean of all participants age was 69.6, median 68.5 years old. Before the start of the program, all participants were acquainted with its course and participated voluntarily. From the view of home residence, from the 20 involved participants, two were living in senior homes, all others were living at home in a family environment. From the view of partnership, from the 20 involved participants, 11 participants were living without a partner, 9 were married.

Procedure

The research study was carried out in the Czech spa town Bechyně in the spa resort Jupiter, where the clientele mostly seniors represent (usually 80%) in the age of 65 and over. The indication groups of spa and rehabilitation care in the Jupiter spa facility are persons with the musculoskeletal and nervous system diseases (see Table 1), which, with the exception of injuries, manifest and worsen just elderly. The Jupiter Bechyně Spa provides spa and health rehabilitation care in the form of comprehensive or contributory care in the indicator groups VI and VII according the code of health insurance companies (Table 1). Accommodation of spa clients in the Jupiter spa resort is provided in single, double and triple rooms. Each room has its own bathroom with toilet and shower or bath.

Table 1 Indication groups of spa and rehabilitation care in the Jupiter spa facility

<table>
<thead>
<tr>
<th>Nervous diseases (indication group VI)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VI/1 Polyneuropathy with paretic manifestations</td>
</tr>
<tr>
<td>VI/2 Root syndromes of vertebrogenic origin</td>
</tr>
<tr>
<td>VI/3 Primary, secondary and degenerative neuromuscular diseases</td>
</tr>
<tr>
<td>VI/4 Parkinson's disease</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Locomotive organs diseases (indicator group VII)</th>
</tr>
</thead>
<tbody>
<tr>
<td>VII/1 Rheumatoid arthritis st. I. - IV. (including juvenile arthritis)</td>
</tr>
<tr>
<td>VII/2 Ankylosing spondylitis (Bechterew's disease)</td>
</tr>
<tr>
<td>VII/3 Other seronegative spondarthritides (psoriatic arthritis, Reiter's syndrome, enteropathic arthritis). Secondary arthritis, Non-articular rheumatism</td>
</tr>
<tr>
<td>VII/4 Diffuse connective tissue disease. Osteoporosis</td>
</tr>
<tr>
<td>VII/5 Bone changes - consequence of work in compressed air - occupational disease</td>
</tr>
<tr>
<td>VII/6 Painful syndromes of tendons, tendon sheaths, bursa, sternal muscles, skeletal muscles or joints</td>
</tr>
<tr>
<td>VII/7 Coxarthrosis, gonarthrosis, arthrosis in other locations</td>
</tr>
<tr>
<td>VII/8 Osteopathy</td>
</tr>
<tr>
<td>VII/9 Chronic, vertebrogenic algic syndrome of functional origin</td>
</tr>
<tr>
<td>VII/10 Conditions after orthopedic surgery - joint replacement</td>
</tr>
<tr>
<td>VII/11 Conditions after injuries of locomotive organs and orthopedic surgeries including conditions after operations of intervertebral discs and spinal canal stenosis</td>
</tr>
</tbody>
</table>
Before the start of the research study, the spa physicians selected the participants eligible for participation in the research. Spa paramedics were trained to assist with intervention. At the first meeting, clients were acquainted with the content and course of the intervention. Clients completed and signed informed consent and completed anamnestic self-assessment test. In addition, Tinneti’s static and dynamic balance tests were performed with them. Then they completed the SF 36 Quality of Life Questionnaire. The four week intervention was applied during the spa stay. Each week, one educational unit of 90 minutes was performed with the participants. It consisted of motivational part, physical exercises part, breathing exercises, relaxation, and concentration techniques. Physical, breathing and relaxation techniques have been adapted from yoga techniques - relaxation, mudras, concentration, meditation, asanas, pranayama - diaphragmatic breathing, full yoga breathing, Nadi Shodhana, ujjayi. Clients continued to work with this program on a daily basis, with the assistance of an assistant. The program was complemented by discussions focusing on ethics, life philosophy, reducing stressful situations, proper nutrition and a drinking regime. For each week, participants received a methodological sheet with motivation, tasks and recommendations. At the end of the intervention program, patients were again subjected to anamnestic self-assessment and Tinneti’s static balance and dynamic tests. Then they absolved again SF-36 survey and discussed the course of the entire intervention program with an emphasis on feedback of participants. All investigations and educational units took place in the Jupiter Spa in the halls on the first floor. After completing the research, all the obtained data were evaluated and statistically processed, and after the results, conclusions and recommendations were determined.

**Diagnostics methods:**
Followed diagnostic methods were used in the investigation:

- **Medical Anamnesis:** The background of a person accumulated data concerning basic information and a medical problematic background for use in analysing of the actual health condition of senior age.
- **Functional anthropological examination:** It was created of selected classical anthropometry methods, which were non-invasive, using anthropometric instruments as anthropometer, digital personal scale, Harpenden calliper, manual dynamometer type Collin. Following parameters were examined: Body height, body weight, BMI, girth of chest across mesosternale, girth of waist, abdominal circumference, gluteal circumference, arm circumference relaxed, calf circumference maximal, biepicondylar width of humerus, biepicondylar width of femur, width of wrist, width of ankle, girth of thigh, girth of knee, girth of ankle; thickness of 7 selected skinfolds – calliper measurement type Harpenden (biceps, triceps, suprailiac, abdominal, subscapular, anterior thigh, calf medial). Body Composition Analysis using In-Body 230. The methods in the Functional anthropological examination were provided according methodological description of Bláha (2017).
- **“Tinneti’s test of Balance”** (Tinneti, et al. 1990) evaluates the balance ability score of seniors and serves to evaluate the results of the intervention. Evaluates the overall balance score from the components: static balance score and gait score.
- **RAND 36 Short Form Health Survey (SF-36):** The survey SF-36 represents widely used tool to determine the quality of life related to health in seniors, designed to research and monitor the quality of senior specific population and of
senior general population life as well. In general the questionnaire SF 36 is sensitive to all problems in areas of physical, mental and social health in aging. It consisted of 36 questions grouped into 9 categories (see Table 2). The SF-36 is a tool managed by a non-profit organization RAND Corporation (ÚZIS, 2018; Ware et al, 1993).

- The test “Anamnestic Self-Assessment” (Hošek 2017) was developed in frame of the project GAČR ID 17-25710S “Basic research of balance changes in seniors”. We present here the new diagnostic tool in specific details as the first part of the results.

INTERVENTION
Description of the intervention program process
Week 1 - You are never alone
The aim of the first week was to realize that in life one is not alone. There is a certain anchoring in society, but main is to be in balance with self. There are various associations and associations where you can meet others. There was a discussion on this topic in the educational unit. Part of the program this week was to practice diaphragm (abdominal) breathing. This type of breathing is an important compensatory means against stress and stress. It helps to normalize blood circulation, digestion and tissue regeneration. The first exercise to achieve this is to inhale and then to exhale slowly. The diaphragm at this time pushes the abdominal organs down to the pelvic floor and creates space for maximum deployment and pump of air into the lungs. Exhaling longer than inhaling leads to the release of the whole organism.

The physical exercises of this week were based on yoga sarvahitaasan in sitting on a chair including pulling arms up, turning the shoulders, practicing with fingers. At the 1st educational unit, the participants were checked and instructed how to handle each movement correctly, in synchirization with breathing, closed eyes, etc. They repeated themselves throughout the week.

Week 2 - Nothing is impossible
The 2nd educational unit was focused on self-acceptance. Psychological benefits of self-acceptance include mood regulation, alleviation of depression symptoms, increased positive emotions. Self-acceptance is also considered necessary for good mental health. In addition to psychological benefits, self-acceptance can also have physical benefits. The results of a 2008 study show that older women with higher levels of positive relationships with others and self-acceptance showed lower levels of glycosylated hemoglobin, a marker of glucose/insulin resistance (Ryff, 2008). The physical exercise this week was the practice of nasal breathing with internal attention to the inhalation and exhalation process, in which patients learned to use hand wisdom. Mudras act as neuromuscular stimulators. With this exercise, the patients tried to positively influence physical and mental functions and induced overall calming of the organism. Afterwards, there was an exercise for the development of deep calm breathing, brain gymnastics - practicing the fingers and toes and another balance exercise sitting on a chair.

Week 3 - Movement is life
The third educational unit concerned the necessity of a part of movement in our lives. The physical activity of a person corresponds to the quality of his life. Modern scientific knowledge shows that movement is intertwined with the psychological development and human health. It is important to realize that just as movement is part of everything around us, nature and the entire universe, it is an integral part of ourselves, a symptom of every life. Therefore, it is very important
not to underestimate the movement and to try to involve as many muscles as possible every day, including the facial, hand and foot muscles at a slow pace in the respiratory synchrone. If serious health reasons do not allow us, massage. In the educational unit there was a demonstration of hand and foot massages. In the main part of the educational unit, there was also the exercise of balance in sitting on a chair and standing behind a chair with support, repetition of exercises from previous weeks, a new breathing exercise “lion grimace” to relax the muscles in the face and relieve stress. The exercise benefits the vocal cords and diaphragm, the muscles of the face and neck, stretches the tendons on the fingers of the hands, relaxes the jaw joints, and has a preventive effect on cervical, ear and nose diseases. Cleans the tongue and improves articulation. This was followed by a vibration exercise - chanting the "OM" mantra. When this mantra is chanting, there are vibrational effects in the diaphragm, lung and brain areas, leading to positive physiological effects.

**Week 4 - Enjoy life and every moment of it**

The last educational unit devoted itself to realizing the joy of being. Patients painted each flower and concentrated on the inner image of the flower in the meditation section. Their task was to imagine its color, shape and smell. The aim of this exercise was to evoke an inner sense of joy and harmony. There was also an exercise to develop balance - playing flowers, which was accompanied by singing together. Exercises and breathing techniques from previous lessons were also repeated. Awareness of the state of peace, peace, freedom. At the end of the discussion there was a discussion on the length of human life and human health.

**Statistics**

The Wilcoxon paired test was used when the critical value was p <0.05. A robust Wilcoxon pair test was used to statistically evaluate the significance of the median differences between the phases of the experiment in the Tinneti equilibrium and gait test. This is a non-parametric test. The calculation of the test is based on the paired values of two measurements on one sample: quantities X and X’ (measurements before and after the experimental intervention).

**RESULTS AND DISCUSSION**

On the base of the data analyses the following results can be stated. The Tinetti balance score, the Tinetti dynamic score and the Tinetti summary score were clearly improved after the intervention program (see Table 2). These results verify the hypothesis H1.

The SF-36 survey results show that all patients are most restricted in physical activity and overall vitality (items 3E, 3F of SF-36). All other investigated parameters show the relation to the limitation of physical activity. Low assessment of health changes in spa patients can be attributed either to acute treatment after an injury, surgery or outbreak, or of the repeated treatment of chronic illness, which is not expected to improve the state of health compared to the previous year. Nevertheless, the results show that there has been an improvement of 1.5% in the overall perception of health after the intervention program. The greatest progress was seen in the limitations caused by emotional problems by 10.05%, physical activity limitations by 8.75% and overall mental health by 8.5% (items 9A, 9B, 9C, 9D, 9E, 9I of SF-36). Evaluation of the SF 36 questionnaire after the end of the intervention wellness program clearly shows an improvement in the perception of mental balance (items 10, 11b of SF-36; Table 2). These results verify the hypothesis H2.
Balance represents a very important indicator of quality of life for the seniors 65+. The results of the analysis showed a significant improvement in the Tinetti static balance score (p <0.005), in the Tinetti dynamic balance score (p <0.005), and in the Tinetti summary balance score (p <0.001), see Table 2. This confirms that the spa environment is an ideal place to the intervention “Life in Balance”. The great advantage of this environment is the time that patients can devote to themselves, as well as the possibility of checking the daily repetition of the intervention by the medical staff, the possibility of constant help and the necessary consultations due to their continuous presence. During each week, patients asked whether they were doing the exercises correctly, doing different exercises together in groups, not alone, so they did not have to force themselves to do the exercises. The results confirm that the right intervention based on yoga concept can positively influence the seniors balance in the bio-psycho-social context. These results are consistent with the results of studies of a similar nature (Butterfield, Schultz, Rasmussen, Proeve, 2017; Büsing, Michalsen, Khalsa, Telles et al 2012). In addition, the intervention program took place in winter, in December, when the spa is calm, and patients spend most of their time indoors and can concentrate better.

For repetition of the exercise they had a common room where they could meet in groups and according to their narration often enjoyed a lot of fun during the exercise. Interviews with the participants show that they would like to see a similar intervention program in their home environment. Initially, they were worried about the joint exercise if they could handle it at all, but they confirmed that the concerns were unjustified. On the contrary, they often found the exercises simple and very pleasantly surprised by the positive effects they achieved in a very short time. They confirmed that they felt more relaxed during the four weeks, that they felt they were part of something important and that they enjoyed the whole intervention program. None of them felt alone during the spa treatment, they were part of a good team. If they were not happy at the first moment, they were patient and docile and at the end of the program were able to conduct the exercises themselves. During the feedback, they stated that they did not feel sad and depressed during the intervention program, which certainly correlates with collective exercise. These findings confirm the link between social

Table 2 Significant changes of parameters after the intervention (n=20; 14 females, 6 males)

<table>
<thead>
<tr>
<th>Variable</th>
<th>Stage 1 Median (quartiles)</th>
<th>Stage 1 Mean ± SD</th>
<th>Stage 2 Median (quartiles)</th>
<th>Stage 2 Mean ± SD</th>
<th>Difference* p-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>q3E</td>
<td>3 (2, 3)</td>
<td>2.45 (0.759)</td>
<td>0 (0, 0)</td>
<td>0.25 (0.55)</td>
<td>0.049</td>
</tr>
<tr>
<td>q3F</td>
<td>2 (1.75, 3)</td>
<td>2.05 (0.759)</td>
<td>0 (0, 1)</td>
<td>0.35 (0.587)</td>
<td>0.021</td>
</tr>
<tr>
<td>q4D</td>
<td>1.5 (1, 2)</td>
<td>1.5 (0.513)</td>
<td>0 (0, 0)</td>
<td>0.2 (0.41)</td>
<td>0.049</td>
</tr>
<tr>
<td>q6</td>
<td>2 (1, 3.25)</td>
<td>2.3 (1.34)</td>
<td>0 (0, 0)</td>
<td>-0.2 (0.41)</td>
<td>0.049</td>
</tr>
<tr>
<td>q7</td>
<td>3 (2, 4.25)</td>
<td>3.2 (1.67)</td>
<td>-1 (-1, 0)</td>
<td>-0.65 (0.745)</td>
<td>0.002</td>
</tr>
<tr>
<td>q9A</td>
<td>3.5 (3, 5)</td>
<td>3.55 (1.23)</td>
<td>0 (-0.25, 0)</td>
<td>-0.25 (0.444)</td>
<td>0.027</td>
</tr>
<tr>
<td>q9B</td>
<td>4 (4, 5)</td>
<td>4.1 (0.912)</td>
<td>1 (0, 1)</td>
<td>0.6 (0.598)</td>
<td>0.001</td>
</tr>
<tr>
<td>q9C</td>
<td>5 (5, 6)</td>
<td>5.3 (0.657)</td>
<td>0.5 (0, 1)</td>
<td>0.5 (0.513)</td>
<td>0.002</td>
</tr>
<tr>
<td>q9D</td>
<td>3 (2, 4)</td>
<td>3.15 (1.04)</td>
<td>0 (-1, 0)</td>
<td>-0.4 (0.598)</td>
<td>0.012</td>
</tr>
<tr>
<td>q9F</td>
<td>4 (4, 5)</td>
<td>4.45 (0.887)</td>
<td>0.5 (0, 1)</td>
<td>0.6 (0.681)</td>
<td>0.002</td>
</tr>
<tr>
<td>q9I</td>
<td>4 (3, 4)</td>
<td>3.6 (0.94)</td>
<td>1 (0, 1)</td>
<td>0.65 (0.745)</td>
<td>0.002</td>
</tr>
<tr>
<td>q10</td>
<td>4 (3, 5)</td>
<td>3.85 (1.09)</td>
<td>0 (0, 1)</td>
<td>0.3 (0.47)</td>
<td>0.015</td>
</tr>
<tr>
<td>q11B</td>
<td>2 (1.75, 3)</td>
<td>2.15 (0.875)</td>
<td>0 (0, 0)</td>
<td>-0.2 (0.41)</td>
<td>0.049</td>
</tr>
<tr>
<td>Tinetti Static</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Balance Score</td>
<td>13 (8.75, 16)</td>
<td>11.9 (5.01)</td>
<td>0 (0, 1.25)</td>
<td>0.7 (0.979)</td>
<td>0.005</td>
</tr>
<tr>
<td>Tinetti Dynamic</td>
<td>10.5 (6.75, 12)</td>
<td>9.15 (4.02)</td>
<td>0 (0, 1.25)</td>
<td>0.75 (1.12)</td>
<td>0.005</td>
</tr>
<tr>
<td>Tinetti summary</td>
<td>24 (15, 28)</td>
<td>21.1 (8.74)</td>
<td>1 (0, 2)</td>
<td>1.45 (1.76)</td>
<td>0.001</td>
</tr>
</tbody>
</table>

*The differences were evaluated using a robust paired Wilcoxon’s test

Furthermore, during the intervention it was found that the physical balance of the patients improved substantially. Of course, kinesiologic treatment is involved in this improvement under the supervision of experienced health care workers, especially physiotherapists, but certainly also intervention intervention. In this respect, it would be beneficial to carry out a research investigation on a much larger number of patients and to compare the results with a control sample of patients not participating in the intervention. Research would provide more accurate data on the correlation of intervention with kinesiological treatment.

Due to the continuing increased risk of falling diagnosed in five patients (3 females, 2 males), they were advised to continue the intervention program after returning from spa treatment. Given the results that have shown an improvement in balance and walking after four weeks of intervention, there is a strong assumption that if they continue the program on their own, they can significantly improve their balance and walking, thus avoiding the risk of falls and injuries. Healthy and regular patient meals and a well-maintained drinking regimen have certainly contributed to the well-being and benefit of the balance intervention. Last but not least, the approach of paramedics who supported participants throughout the applied intervention.

CONCLUSIONS

The research clearly demonstrated the positive impact of the intervention on the physical and mental balance ability of the monitored seniors 65+. It has been proven that during the four-week spa rehabilitation care, appropriate intervention can enhance the treatment of patients and thus affect their overall health. From the results of the research we can draw a clear recommendation to include the interventional wellness program “Life in Balance” as a part of the spa therapeutic rehabilitation care and thus help to increase the success of treatment and strengthen prevention of further falls, injuries and diseases.

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