

## Mental effects of aquatic occupational therapy among women engaged in indoor and outdoor physical activity forms

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### Abstract

*Purpose:* Occupational therapy that uses a person's stay by natural, open waters is known as thalassotherapy and refers to a wide range of health effects, ranging from improving thyroid function, skin appearance and aromatherapy, to strengthening immunity and improving well-being in contact with cold water. During the coronavirus pandemic, severe neurotic-depressive symptoms are associated with numerous limitations in the space of daily living. At the same time, many examples of group physical activity in cold water, known as swimming, have been observed during this period. It is an important condition for both physical and mental well-being which enables social relations. The aim of the study was to compare situational anxiety and body perception levels in women engaged in outdoor (ice-swimming) and indoor (aqua fitness) forms of physical activity in water during the coronavirus pandemic. *Material:* The study was conducted among 60 female subjects who declared water-based exercise, including 30 subjects practicing ice-swimming (age  $39.93 \pm 11.15$ ) and 30 doing aqua fitness (age  $50.63 \pm 10.87$ ). The research tools consisted of two questionnaires, namely State-Trait Anxiety Inventory (STAI) in the version assessing situational anxiety and the Body Esteem Scale (BES). *Results:* The claimed situational anxiety level in the positive feelings scale showed one statistically significant difference in favor of respondents engaged in ice-swimming, which turned out to be relaxation ( $p < 0.001$ ). More important differences in favor of females practicing ice-swimming were observed in the case of negative indicators of situational anxiety. They concerned declared depression ( $p < 0.001$ ), as well as tension, resentment, and concern ( $p < 0.05$ ). practitioners of ice-swimming achieved statistically better results than the representatives of the aqua fitness group in 8 out of 35 body assessment elements. *Conclusions:* Limiting the possibility of using indoor sports facilities affects situational anxiety and reduces the sense of acceptance of one's own body, as opposed to unlimited access to outdoor recreational spaces.

**Key words:** COVID-19, situational anxiety, body perception, ice-swimming, aqua fitness.

### Introduction

Occupational therapy is a form of rehabilitation whose task is to activate the patient by performing specific activities of physical and mental rehabilitation. Its special type is thalassotherapy, i.e. a form of interaction that uses direct contact with air and sea water. There are also elements of music therapy such as the sound of the sea and wind, as well as the poly-sensory experience of the world through the touch of sand and stone or touching and tasting water (Charlier, 1982). Many studies indicate that the natural environment can have a positive impact on human health and well-being (Mitchell & Popham, 2008; Shestopal et al., 2021), improve health self-esteem (Maas et al., 2009; Grygus et al., 2019), and facilitate recovery after stress (Tyrväinen et al., 2014; Dido et al., 2021).

The COVID-19 pandemic poses real risk to human health and life around the globe due to the disease itself and its complications (Anderson et al., 2020). It is also a major contributor to enormous changes in everyday life, many of which may be viewed as negative. As a result, depression and anxiety symptoms are becoming more and more common (Rajkumar, 2020; Qiu et al., 2020), the intensity of which often exceeds the individual's adaptation abilities. It can be assumed that certain groups of people are particularly vulnerable to stress overload related to the consequences of the epidemic and, as a consequence, to developing symptoms of depression or generalized anxiety disorder. For some people, previously natural circumstances, due to restrictions introduced during the pandemic time, may turn into difficult situations, thus increasing anxiety or depression. This may apply to people who used sports facilities for recreational purposes in the pre-pandemic period.

In an effort to slow down the spread of COVID-19, governments around the world have adopted restrictive policy measures which have undoubtedly restricted the freedom of movement of their citizens. At the same time, however, experts advocated continuing exercise during the crisis to avoid health problems such as increasing obesity, depression, infections and cardiovascular diseases as much as possible (Chen et al., 2020). To tackle this health dichotomy triggered by COVID-19, lock-down scenarios with varying degrees of freedom of movement have been implemented. While countries such as China, India, New Zealand, Italy and France have imposed

very strict measures on how far people can physically move outside their homes, forbidding any unnecessary public activity, for example Tanzania, Sweden and Belgium have chosen the so-called nationwide "lock-down light" (Lau et al., 2020).

During this blockade in early spring 2020, schools were closed and the home office became the new standard whenever possible. In addition, citizens could and were even encouraged by governments to exercise, but with significant restrictions. Undeniably, this posed a threat to maintaining adequate mobility as an element of lifestyle and also a condition of health (Bendíková, 2017). In such situations, promotion of healthy lifestyle should assume changes in the structure of physical activity undertaken (Bendíková & Smoleňáková, 2018; Nesterchuk et al., 2020). More specifically, citizens were encouraged to do exercise indoors (Hammami et al., 2020) as well as outdoors, but limited to activities performed single-handedly, or possibly with members of the same household. Besides, with all fitness centers and other sports facilities being closed and most sports competitions postponed or even canceled, organized sport has suffered from a widespread crisis with multiple detrimental economic and social consequences (Mann et al., 2020). To a large extent, this problem still concerns swimming pools, made available only to professional athletes, and virtually unavailable for people not related to qualified sports.

Meanwhile, water-based exercises enjoy unflagging popularity. Their therapeutic importance for people with orthopedic disabilities is emphasized (Robert et al., 1996). Moreover, overweight people believe that chest-deep water is a motivating factor because the body is hidden from the eyes of others during training (Lepore et al., 1998). Synergistic effects caused by buoyancy and resistance create an environment that requires considerable energy expenditure with a relatively short range of motion. Water provides a convenient exercise environment for patients with arthritis, back pain, osteoporosis, or other medical conditions which may limit workout on land. It was found that walking in water with a depth from the waist to the chest and participation in aqua aerobics ensure a sufficient load for the development of cardio-respiratory efficiency (Sheldahl et al., 1987). There are also reports of the physiological renal-endocrine response during rest and exercise in older adults (Christie et al., 1990).

Pool activities are a form of exercise that is similarly beneficial from the social point of view. By participating in group activities, there is an opportunity to strengthen social integration, deficits of which are a crucial issue in pandemic times. Water is also attractive due to its recreational and educational values, favoring the emergence of independence and emotional fulfillment (Stein & Motta, 1992; Stan, 2012).

Limiting the possibility of achieving one's own fitness and health goals by visiting swimming pools caused a resound in the COVID-19 era in the form of a sharp increase in the popularity of ice-swimming. In recent years, swimming in water below 5°C has transformed regionally into a year-round sport in which many swimmers regularly participate and compete in both local and international competitions (Knechtle et al., 2020). Numerous studies have suggested that cold water swimming brings many health benefits (Gibas-Dorna et al., 2016), including changes in hematological (Zenner et al., 1980) and endocrine functions (Gundle & Atkinson, 2020), fewer infections of the upper respiratory tract (Collier et al., 2015), reduction of mood (Van Tulleken et al., 2015) and general well-being disorders (Huttunen et al., 2004), or cold adaptation (Kalshtein, 1964). In the countries of the Baltic Sea Region, this custom is associated only with the winter season, while in Russia it has long been part of the Christmas tradition associated with the Epiphany (Knechtle et al., 2020).

The purpose of the research was to identify possible differences in the perception of situational anxiety and body perception among women engaged in outdoor and indoor forms of water-based physical activity during the coronavirus pandemic.

Owing to the unlimited use of open waters and the lack of such a possibility in the case of sports facilities, closed due to the COVID-19 restrictions, it was assumed that the feeling of situational anxiety would be lower, and body perception higher in the group of women declaring participation in outdoor physical activity.

## Material & methods

### *Participants*

The research was conducted among 60 female subjects who declared water-based physical activity. 30 women represented the ice-swimming group (age  $39.93 \pm 11.15$ ), and another 30 female participants - the aqua fitness group (age  $50.63 \pm 10.87$ ). At the time of the study, ice-swimming representatives were engaged in regular training sessions, while aqua fitness representatives did not have access to swimming pools closed because of coronavirus pandemic restrictions.

### *Research design*

The research method was a diagnostic survey in which the questionnaire technique was used. Research tools consisted of two questionnaires. The first is the State-Trait Anxiety Inventory (STAI) in the version describing the state of the respondent here and now, and therefore understood as a temporary, transient emotional state, as opposed to anxiety, which is treated as a persistent and permanent personality trait (Spielberger et al., 1983). The study used a tool which was the Polish adaptation of the original questionnaire (Spielberger et al., 1987). It contains 20 statements which people use to describe themselves. Respondents were asked to define their current state by marking one of the four answer options which best corresponded to their

beliefs. These options are ranked on the Likert scale, in which: definitely no = 1, rather not = 2, rather yes = 3, definitely yes = 4. Out of 20 presented statements, 10 are emotionally positive, and another 10 - negative.

The second of the questionnaires is the Body Esteem Scale (BES) by Franzoi & Shields (1984), in the Polish adaptation (Lipowska & Lipowski, 2013), which allows to determine the body image of respondents. The scale consists of 35 items in three sub-scales: sexual attraction, weight control and physical fitness. Individual BES questions about corporeality, respondents could answer on a 5-point Likert scale, where 1 = I have strongly negative feelings, 2 = I have moderately negative feelings, 3 = I have no feelings, 4 = I have moderately positive feelings, 5 = I have strong positive feelings.

*Statistical Analysis.*

The statistical significance of the differences between the responses of ice-swimming representatives and the aqua fitness subjects was assessed using the Student t-Test. The results are presented as means with standard deviation and  $p < 0.05$  was considered statistically significant.

**Results**

The declared situational anxiety level in the scale of positive feelings showed one statistically significant difference in favor of ice-swimming respondents. It concerned the level of relaxation ( $p < 0.001$ ). The results are displayed in Table 1.

*Table 1*

**Positive indicators of the situational emotional state of female subjects engaged in ice-swimming and aqua aerobics**

Item	Ice-swimming respondents (n – 30)	Aqua fitness respondents (n – 30)	t	p
	Mean±SD	Mean±SD		
1. I feel calm	3,86±0,34	3,76±0,43	0,99	0,325
2. I feel safe	3,76±0,50	3,60±0,67	1,08	0,282
3. I feel at ease	4,00±0,00	4,00±0,00	0,00	1,000
4. I feel refreshed	3,73±0,44	3,73±0,44	0,00	1,000
5. I feel good	4,00±0,00	4,00±0,00	0,00	1,000
6. I feel self-confident	3,73±0,44	3,55±0,63	1,27	0,207
7. I am relaxed	4,00±0,00	3,63±0,55	3,61	0,000*
8. I am satisfied	3,83±0,37	3,80±0,40	0,32	0,743
9. I am joyful	3,26±0,44	3,26±0,44	-0,00	1,000
10. I am happy	3,73±0,52	3,80±0,48	-0,51	0,609

More significant differences in favor of women practicing ice-swimming, who, unlike aqua aerobics supporters, had the opportunity to perform this form of physical activity during the research, were observed in the case of negative indicators of the situational emotional state. They concerned the declared level of depression ( $p < 0.001$ ) as well as tension, resentment and worry ( $p < 0.05$ ). The results are presented in Table 2.

*Table 2*

**Positive indicators of the situational emotional state of female subjects engaged in ice-swimming and aqua aerobics**

Item	Ice-swimming respondents (n – 30)	Aqua fitness respondents (n – 30)	t	p
	Mean±SD	Mean±SD		
1. I feel tense	1,16±0,37	1,73±0,82	-3,40	0,001*
2. I am resentful	1,00±0,00	1,36±0,66	-3,00	0,003*
3. I am depressed	1,00±0,00	1,43±0,56	-4,17	0,000*
4. I am afraid	1,00±0,00	1,00±0,00	0,00	1,000
5. I feel anxious	1,10±0,30	1,16±0,37	-0,75	0,456
6. I am upset	1,13±0,34	1,13±0,34	0,00	1,000
7. I feel shaky	1,06±0,25	1,03±0,18	0,58	0,561
8. I feel on edge	1,06±0,25	1,03±0,18	0,58	0,561
9. I am worried	1,00±0,00	1,40±0,67	-3,24	0,001*
10. I am too excited	1,43±0,50	1,46±0,50	-0,25	0,799

Out of 35 elements comprising own body perception, in eight cases, ice-swimming practitioners achieved statistically better results than aqua fitness representatives. In the fitness subscale, four significant differences were found, while in the subscales of weight control and sexual attractiveness - two statistically significant differences in each subscale. The results are shown in Table 3.

Table 3

Statistically significant differences concerning own body image of ice-swimming and aqua aerobic practitioners

Item	Ice-swimming respondents (n – 30)	Aqua fitness respondents (n – 30)	t	p
	Mean ± SD	Mean ± SD		
1. efficiency	3,03±1,03	2,06±0,36	4,83	0,000
2. muscle strength	3,26±1,01	2,30±0,65	4,39	0,000
3. energy level	4,06±0,82	3,53±0,86	2,44	0,017
4. silhouette	3,76±0,97	2,90±1,26	2,97	0,004
5. sex drive	3,56±1,10	2,13±0,43	6,61	0,000
6. health	4,23±0,85	3,53±0,86	3,15	0,002
7. sexual activity	3,86±1,00	2,86±1,04	3,77	0,000
8. weight	4,40±0,62	3,80±0,80	3,23	0,002

## Discussion

Exercise-related contact with the natural environment may turn out to be extremely important for enhancing mental health and emotions which affect it. Although there is relatively little confirmed scientific information on this subject (Focht, 2009; Mitchell, 2013; Loureiro & Veloso, 2014; Hartig et al., 2014), it confirms synergistic, greater effects of sports activity and contact with nature as determinants of better well-being than in the case of indoor physical activity. As far as the group analyzed in these studies is concerned, we should assume that weaker results of the assessment of anxiety as the current state, and some worse opinions about own body perception of women declaring participation in indoor water based exercise, are related to the lack of deep awareness of contact with nature. It is much more likely that these results are the consequence of the inability to use sports facilities closed during the pandemic. It is possible to raise some natural values of water reservoirs, understood comprehensively as the so called thalassotherapy (Charlier & Chaineux, 2009; Maraver et al., 2011) which cannot be observed at the swimming pool or in the aqua park, but it is not likely to determine the significant differentiation of health effects.

Aquatic therapy is an intervention technique that has so far been considered primarily in the context of using indoor sports and recreation facilities (Sanders et al. 2016). Aquatic therapy has a beneficial effect on the improvement of various body functions, including the musculoskeletal, cognitive and sensory components (Herold et al., 2016). However, a significant decrease in anxiety experiences and a sense of increased life quality have been also found among aquatic therapy participants (Johnson et al., 2016). The mental aspect of water therapy is also indicated by the studies conducted by the Canadian Mental Health Association (2018). It has also been found that body immersion to the chest level releases hormones such as the feel-good endorphins, oxytocin that helps build social relationships and stress resistance, and is responsible for the proper functioning of the nervous system, and dopamine (Lynch & Sawyer, 2016).

Although the effects of contact with water of any temperature can be comprehensively positive, its influence on the functions of the system in the conditions of its low temperature is of particular importance. A pilot study showed an improvement in the life quality among people with a depressive episode exposed to cyclical extremely low temperatures intervention (Rymaszewska et al., 2019). Similar effects were achieved in people affected by chronic fatigue stimulated by low temperatures (Miller et al., 2016).

Objective effects of using water as an environment for physical activity, whether conducted outdoors or indoors, are undeniably positive (Takeshima et al., 2002). However, they do not reflect all health changes caused by contact with water, as some of these changes concern subjective feelings. For example, pool exercise has been proven effective in the treatment of depression in 16 elderly subjects who underwent a 12-week therapy including two classes a week, 45 minutes / session at a low intensity (50% to 60% of maximal heart rate or Borg scale scores of 13 to 14) (Silva et al., 2019). These classes were organized indoors, though other authors confirmed that outdoor swimming in cold water positively influences reducing symptoms such as rheumatism, fibromyalgia, and asthma (Huttunen et al., 2004).

Regular winter swimming also improves overall well-being and may even have an antidepressant effect (Lindeman et al., 2002; Bottley, 2019). Symptomatic is the case of a 24-year-old woman with symptoms of severe depression and anxiety. The patient was treated from the age of 17 and her symptoms did not respond to conventional treatment. After giving birth to her daughter, she wanted to resign from medications and symptoms. To this end, a new intervention was developed which included a weekly ice-swimming program. This resulted in an immediate improvement in mood after each session and a permanent and gradual reduction in depression symptoms. One-year intervention ultimately led to a reduction in medication use, and eventually to its discontinuation (Van Tulleken et al., 2018). It is assumed that due to the increase in the concentration of catecholamines, ice-swimming may be a method of treatment for depression, activating the sympathetic nervous system and increasing the concentration of norepinephrine and  $\beta$ -endorphin (Shevchuk, 2008).

## Conclusion

The COVID-19 pandemic period verified social attitudes towards physical activity in conditions of social isolation and closed sports and recreational facilities. Every follower of physical recreation had a chance to keep in touch with outdoor physical activity during this time. As observations indicate, a significant percentage of the population has benefited. In line with this trend, there has been an increase in the popularity of ice-swimming.

In view of research findings presented in this paper, it should be concluded that limiting the use of indoor sports infrastructure increases situational anxiety and reduces body acceptance among people who used only indoor facilities before the pandemic and still avoid contact with water in the natural environment. This allows us to recognize the truth of the hypothesis advanced before the implementation of the research procedure with high probability. The basis for this is the observation of five statistically significant differences in the assessment of situational anxiety, with 20 items on the anxiety scale assessing this feeling. These differences included levels of perceived relaxation, tension, resentment, depression, and anxiety. However, in the case of accepting one's own body, eight such differences (in efficiency, muscle strength, energy level, silhouette, sex drive, health, sexual activity and weight) were observed, with 35 items on the body rating scale. In all these cases, these differences clearly indicated the advantage of the ice-swimming representatives.

It is difficult to make clear predictions about the maintenance of interest in ice-swimming in the post-pandemic period. However, the spectacular effects of this type of health training should encourage active contact with nature, also in conditions of return to full availability of sports and recreation infrastructure facilities.

## Conflict of interests

The authors have no conflict of interests to declare.

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