

POST COVID-19 OUTDOOR PHYSICAL INTERVENTION EFFECTS ON BODY COMPOSITION IN PERSONS WITH INTELLECTUAL DISABILITIES

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Abstract

In 2021, the Global Wellness Institute demonstrates the growing interest of the entire population in improving of overall health and immune function through various outdoor physical activities. The objective of the study was to exam a potential of outdoor physical activities in relation to the Covid-19 lock down in a group of people with intellectual disability. Material and methods: 50 persons (26 males, 24 females) with mild (15 persons) and moderate (35 persons) intellectual disabilities, aged 18-45, from the Czech Republic, registered in Special Olympics International associations. All subjects were until the physical intervention in Covid-19 lock down regime, i.e. without any indoor or outdoor physical activities. Before the examinations, all participants and their legal representatives signed an informed consent. The Assessment of body composition measured (using Tanita Leicester, and tetrapolar multi-frequency bioelectrical impedance device InBody 230) was used to assess body weight, BMI, body fat percentage and total muscle mass. The 2 weeks outdoor physical intervention focused on fitness improvement was applied. The obtained data were subsequently processed anonymously with security in accordance with the applicable GDPR and Helsinki Declaration directives. During the intervention applied outdoor activities were performed only to the extent appropriate to the physical and mental potential of the participants. Relationships of dependent variables to the sex of the subjects, the experiment, and its individual phases were evaluated by a repeated measures ANOVA model. Results and Conclusions: The intervention led to the significant improvement of body composition, the participants decreased significantly in body fat percentage and increased significantly in muscle mass.

Keywords

Covid-19 pandemic; intellectual disability; outdoor physical activities; body composition.

1 INTRODUCTION

Disability is a physical or mental condition that limits a person's movements, senses, or activities at all. The term "disability" is becoming increasingly used in postmodern society along with the development of medicine that can treat very severe disorders of the human organism. The affected features can be compensated by intact functions. The English term "disability" has become an umbrella at international level in terms of functional disorders and activities. Since 2001 he has been operating the International Classification of Functioning, Disability and Health (ICF). This document defines the term "disability" as "a reduction in functional abilities at the individual or company level that arises when a person with his or her health condition encounters environmental barriers".

This definition corresponds with the view of experts (Smith, 2008; Marcus, Forsyth, 2008; Winnick, Porretta, 2020) who perceive people with disease or disability as a person whose problem arose on the basis of dynamic interaction between a person and environment.

The current trend of health and social care represents the civic model which emphasizes the active social participation of people with disabilities in society. It is necessary for the scientific and research activities of professionals from different professions to support this intention to ensure that disabled citizens are provided with the highest possible degree of autonomy, i.e. decision-making on their own destiny, so that they can participate as much as possible in the life of society. Of course, it is also necessary to gain the support of the general public in order to create conditions for

people with disabilities for as much autonomy as possible.

A very specific group at risk of diseases of civilization and risks of poor lifestyle are persons with intellectual disability. This is because, compared to people with physical disability, there are great sport limitations in the cognitive sphere, i.e. perception, memory, the right reactions in the environment, whether it is orientation in space or adequate decision-making with respect to the given situation (rules, environment, communication, safety during exercises).

In addition to physical health and physical compensation, outdoor physical activities bring mental compensation to persons with intellectual disabilities (Haywood, Getchel, 2018). Válková (2009) states that the American Association on Mental Retardation (AAMR) defines intellectual disability as a significant limitation of existing performance in a social context. According to the AAMR, 7 dimensions of adaptive behavior are declared. If a person fails in at least 3 of them, a person with reduced intellect can be considered:

- Intellectual functions
- Emotional and voluntary imbalances
- Adaptive behavior (failure in at least 3 areas out of 7): self-care, housework, health, safety, decision-making, leisure skills, communication.

It means that in present a multifunctional model of intellectual disability (otherwise called the "ecological model") according to the AAMR is increasingly emphasized. In this concept, intellectual disability is characterized by the interaction between the individual and the social environment (Kornatovská, Rehor, 2021).

Basic specifics of outdoor physical activities for persons with intellectual disability, the trainers are advised to observe some crucial didactic principles, i.e. adequate demonstration; context; maintaining motivation. It is recommended to create the right basic outdoor stereotypes (walking, running, manipulation, etc.); to improve movement control; to improve balance; to increase running, swimming, etc. In addition, persons with intellectual disabilities submit information in such a way as to involve as many senses as possible. Using various didactic aids

to concretize abstract expressions. Great verbalization can be confusing for a person with intellectual disability (Krejčí, Kornatovská, 2017).

Balemans, Bolster (2019) declare that a physically fit and active lifestyle has merit for each individual with intellectual disability, but reduced fitness in combination with higher energy demands during walking results in a high physical strain of walking and consequently a low metabolic reserve. This can cause fatigue during walking and limited walking ability, which are among the most reported complaints in this group. Monitoring, and improving of outdoor activities is therefore essential in rehabilitation of youth with intellectual disability in order to develop a proper fitness status, to participate in outdoor physical activity with peers, and to prevent a health in aging.

The principle of proportionality is particularly important in view of the degree and type of disability. An important element is a game, which allows better attention retention. In the context of open learning opportunities in nature (walking, hiking, elements of experiential education in nature) in people with intellectual disability outdoor activities as athletics, walking, yoga, aquatic activities based on the active experience of movement learning. They are easy-to-implement yet accessible physical activities with a fast and effective effect of integration and inclusion (Whatley, Waelde, Harmon, 2018; Maheshwarananda, 2005). Nature-based programs may be of benefit and support to the health of cancer survivors. These positive health effects were reported for a wide range of program activities, including gardening programs, therapeutic landscapes, dragon boat racing and other outdoor programs. The majority of nature-based programs that specifically address the needs of childhood and AYA cancer survivors can be categorized under the umbrella term of adventure programs (Jong, Mulder, Kristoffersen, Stub, Dahlqvist, Viitasara, Lown, Schats, & Jong, 2022).

According (Krejčí, Vacek, 2021) Covid-19 pandemic represents an exceptional experience in the whole world and still is going through touched everybody. Never before has health and wellness declined so fast. Covid-19 pandemic nor only affected physical health, but

also cause unprecedented levels of stress. Uncertainty, forever lasting and constantly changing restrictions became unmanageable for many people. Already published studies on levels and forms of stress related to depression and mental illness indicate that numbers of individuals suffering from the disease increased by 50- 60% in all age categories. The proactive approach which focuses on a more holistic approach is not widely actively promoted or practiced, even when it is generally accepted that prevention of disease on principles of wellness is the only way to prevent the increasing problems healthcare systems are facing.

The basic dimensions that are regularly monitored are body height and body weight (Gawlik, Zwierchowska, Celebanska, 2018). Persons with intellectual disabilities generally go through the same developmental stages as the intact population, but in some periods the development of psychomotor competences is more limited. A general problem at the time of the Covid-19 pandemic may be hypokinesia, artificially induced by daily sitting - at home, spending time with IT technologies, etc. This brings health problems and complications related to body composition, excess weight, faulty posture (Gao, Wang, Piernas, Astbury, Jebb, Holmes, 2022; Kornatovská, Rehor, 2021).

2 OBJECTIVE

The objective of the study was to exam a potential of outdoor physical activities in relation to the Covid-19 lock down in a group of people with intellectual disability.

Based on the objective of the study the Hypothesis is declared: The applied 2-week outdoor intervention leads to the significant improvement of muscle mass in the participated subjects with intellectual disability.

3 METHODS

3.1 Material and procedure

The sample of subjects was conducted from 50 participants (age interval 18-45, age overage 35.6 years), 26 males (age interval 18-45, age overage 39.6 years) and 24 females (age interval 18-45, age overage

33.1 years). The monitored subjects were selected from persons with mild and moderate intellectual disabilities, aged 18+, from the Czech Republic, registered in Special Olympics International associations. All participated subjects until the applied outdoor physical intervention were staying in one year Covid-19 lock down regime, i.e. without any indoor or outdoor physical activities. Before the examinations, all participants and their legal representatives signed an informed consent. The 2 weeks outdoor physical intervention focused on fitness improvement was applied in subjects. The research procedure and intervention was carried out in a mountain sports complex in the Czech Republic in the form of a sport camp focused on outdoor training and experienced education. This means that all monitored subjects lived in one place during the intervention, under the same conditions (accommodation, diet, training time, sleep time, free time). The same intervention was carried out in 4 parallel groups of the participants with intellectual disability, in each group under the leadership of 1 head coach, 2 assistant coaches and 2 other assistants, who helped with organization and help as needed. The obtained data were subsequently processed anonymously with security in accordance with the applicable GDPR and Helsinki Declaration directives. During the intervention applied outdoor activities were performed only to the extent appropriate to the physical and mental potential of the participants.

3.2 Diagnostics

Body height

Body height was measured using the Tanita Leicester Height Measure device with an accuracy of 0.1 cm.

Body composition

A tetrapolar multi-frequency bioelectrical impedance device InBody 230 was used to gain basic body characteristics such as body weight, body fat percentage, and total muscle mass.

3.3 Intervention

During the 2 weeks intervention, every day, 3-phase outdoor training was applied, i.e. early morning training in nature before breakfast

consisting of cross-country running and various types of warm-up in a natural environment on a mountain meadow with views of the mountain panorama. Breakfast was followed by a morning outdoor training session of 3 hours focused on outdoor athletics. Lunch was followed by a 2-hour rest in the room. This was followed by 3rd phase of outdoor training connected with a walk along a tourist route, enriched with experiential games in nature, orientation in nature and overcoming of natural obstacles. After dinner, there was a personal free time with the possibility of voluntary dance or yoga activities or only rest in nature. From 10 p.m., peace and sleep followed. All activities were applied with respect for individual characteristics and potential in a joyful atmosphere. Motor learning was conducted professionally using the appropriate methods of demonstration, motivation, play, fixation and feedback, mostly in a complex procedure.

3.4 Statistics

Relationships of dependent variables to the sex of the subjects, the experiment, and its individual phases were evaluated by a repeated measures ANOVA model.

4 RESULTS AND DISCUSSION

Body weight

Before the intervention, the average body weight of men was 83.3 (83.2, 83.4) and the average body weight of women was 73.1 (70.1, 79.4). The analysis shows that before the intervention the body weight of the monitored men was 10.2 kg higher. After the intervention, the average body weight of men was 82.3 (82.2, 82.4) and the average body weight of women was 72.9 (69.9, 78.7). After the intervention the body weight of the monitored men was 10.1 kg higher. A decrease in body weight was therefore detected in both sexes, in men and in women after the two-week applied intervention, but the analyzed decreases were not statistically significant, i.e. $p < 0.232$ in males; $p < 0.258$ in females (Table 1, Table2).

BMI

Statistical analysis of BMI proved also no significant changes between PRE/POST measurements in monitored males and females subjects with intellectual disability.

Figure 1 Body composition measures in the pre- and post-intervention in men (n=26)

Measure	Pre	Post	p
Body weight (kg)	83.3 (83.2, 83.4)	82.3 (82.2, 82.4)	.232
BMI (kg/m ²)	27.7 (27.5, 27.9)	27.7 (27.6, 27.7)	.384
Fat (%)	26.7 (26.3, 27.5)	25.2 (25.0, 25.5)	<.001
Muscle mass (kg)	30.5 (30.3, 30.6)	31.5 (30.9, 31.9)	<.001

Figure 2 Body composition measures in the pre- and post-intervention in women (n=24)

Measure	Pre	Post	p
Body weight (kg)	73.1 (70.1, 79.4)	72.9 (69.9, 78.7)	.258
BMI (kg/m ²)	25.6 (25.5, 27.9)	25.4 (25.3, 27.7)	.484
Fat (%)	36.7 (36.1, 38.5)	35.3 (34.7, 36.9)	<.001
Muscle mass (kg)	22.5 (20.8, 23.6)	23.4 (21.2, 23.9)	<.001

Before the intervention, the average BMI of men was 27.7 (27.5, 27.9) and the average

BMI of women was 25.6 (25.5, 27.9). The analysis shows that before the intervention

the BMI of the monitored men was only 2.1 point higher compared to monitored women. After the intervention, the average BMI of men was 27.7 (27.6, 27.7) and the average body weight of women was 25.4 (25.3, 27.7). After the intervention the BMI of the monitored men was 2.3 point higher. A decrease of BMI was detected in female group, after the two-week applied intervention, but the analyzed decrease was not statistically significant ($p < 0.484$, Table 1, Table2).

Fat

Before the intervention, the average fat percentage of men was 26.7 (26.3, 27.5) and the average fat percentage of women was 36.7 (36.1, 38.5). The analysis shows that before the intervention the fat percentage of the monitored women was 10% higher compared to the monitored men. After the intervention, the average fat percentage of women was 82.3 (82.2, 82.4) and the average fat percentage of men was 72.9 (69.9, 78.7). After the intervention the fat percentage of the monitored men was 10.1% higher compared to the monitored men. Significant decreasing of the fat percentage was detected in both sexes, in men and in women after the two-week applied intervention, i.e. $p < 0.001$ in males; $p < 0.001$ in females (Table 1, Table2).

Muscle mass

Before the intervention, the average muscle mass of men was 30.5 kg (30.3, 30.6) and the average muscle mass of women was 22.5 kg (20.8, 23.6). The analysis shows that before the intervention the muscle mass of the monitored men was 8 kg higher. After the intervention, the average muscle mass of men was 31.5 (30.9, 31.9) and the average muscle mass of women was 23.4 kg (21.2, 23.9). After the intervention the muscle mass of the monitored men was 7.5 kg higher. Positive significant increasing of the muscle mass was detected in both sexes, in men and in women after the two-week applied intervention, i.e. $p < 0.001$ in males; $p < 0.001$ in females (Table 1, Table2). Based of the analysis, we can state that the hypothesis "The applied 2-week outdoor intervention leads to the significant improvement of muscle mass in the participated subjects with intellectual disability" was verified.

We can discuss in accordance with the interpretations of Benson and Connelly (2020)

the beneficial and positive effect of the outdoor intervention programs on subjects in terms of functional development of body composition and body integration. It seems that the training of outdoor activities, as well as the training of balance, relaxation and breathing exercises in outdoor environment is significant. As confirmed by Korczak, Zwierchowska, (2020), regular controlled physical activities can only be recommended for the persons with intellectual disability, even using mobile applications. We believe that, based on the positive results of the study, we can make recommendations for outdoor intervention program based on experiential education in nature, as a prevention of health complications connected with Covid-19 pandemic (e.g. increased and rapid fatigue, allergic symptoms, asthma, etc.). According to that, it can be argued that men with intellectual disability can respond positively to outdoor exercise intervention, including reducing body fat and increasing muscle mass, thanks to testosterone. However, it is also necessary to discuss the increase in muscle mass and fat loss in women 65+. The authors (Grigoletto, Mauro, Oppio, Greco, Fischetti, Cataldi, et al, 2022; Hoey, Staines, Walsh, et al, 2017) state, that intensive course of outdoor activities may affect the use of protein throughout the body in healthy older women. Participants after the outdoor intervention had lower body fat and higher muscle mass than those who did not practice outdoor activities. Moreover, they also tended to have a better balance. Importantly, practicing outdoor activities systematically, can improve protein utilisation and lead to the maintenance of muscle mass in females even later in life, when muscle loss is common.

5 CONCLUSIONS

Significant positive improvement with important body integration, including fat decreasing and muscle mass increasing, points to the high importance of outdoor activity intervention, which may represent significant part of controlled physical activities for persons with intellectual disability. The findings of the study are new and provide a basis for future research intervention to promote rehabilitation and physical therapy in persons with intellectual disability. We recommend to bring persons with intellectual

disability to outdoor movement skills and to facilitate them to a joyful interest in movement learning in nature. The study results may be useful for specialists of physical therapy, rehabilitation and applied physical activities.

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