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Review

THE EFFECTS OF RESTRICTIONS DURING THE COVID-19 PANDEMIC ON PHYSICAL ACTIVITY AND MENTAL HEALTH OF THE ELDERLY

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SUMMARY – Regular physical activity and maintaining fitness reduce the risk of chronic cardiovascular and metabolic diseases, reduce the risk of exacerbation of existing diseases, maintain physical and mental health, and contribute to healthy and successful aging in the elderly. It is of particular importance during the prolonged COVID-19 pandemic. The aim of this review is to present relevant knowledge about the effects of restrictions and social distancing established with the aim of suppressing the COVID-19 pandemic, on physical activity and mental health of elderly people. During the pandemic, numerous authors have reported a decrease in the share of physically active population and those that used to exercise regularly. The time spent in activity decreases, energy expenditure decreases, and the time spent sedentary increases although the results in all segments related to physical activity are not consistent. Lockdown measures significantly worsen insomnia, sleep quality, feelings of loneliness, anxiety and depression in older people, especially in women. During the restrictive measures caused by the COVID-19 pandemic, physical activity and exercise significantly contribute to the maintenance and improvement of physical and mental health.

Key words: *Physical activity; Exercise; Mental health; Elderly; COVID-19 restrictions*

Introduction

In two and a half years, from the beginning of 2020 to June 2022, more than 530,000,000 people worldwide were infected with the SARS-CoV-19 virus, and 6,200,000 people succumbed to COVID-19[1]. Elderly people, aged 65 or older, were the population group at the highest risk of contracting and dying from COVID-19 during the 2020-2022 pandemic caused by the rapidly spreading SARS-CoV-2 virus.

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Cardiovascular complications are common in patients with COVID-19 and are associated with inflammatory changes, endothelial dysfunction, and platelet activation[2]. In addition to older age and male sex, which increase the risk, diseases such as atherosclerosis, existing cardiovascular disease, obesity, hypertension, diabetes, chronic lung and kidney diseases are comorbidities that increase the risk of severe forms of disease and death in COVID-19 patients[3,4] .

External factors such as inappropriate diet, cigarette smoking and physical inactivity contribute to this risk[4]. These also are factors that worsen under the conditions of restrictions, social distancing and isolation introduced with the aim of preventing the spread of the COVID-19 pandemic, and especially protecting the elderly. The restrictive measures led to changes in everyday life and lifestyle habits, and were reflected in the level of physical activity, eating habits, physical and mental health of the elderly[5-19].

According to the World Health Organization, insufficient physical activity is considered as the leading contributor to global mortality[20]. The consequences of insufficient physical activity in the elderly lead to sarcopenia, reduced functional capacity, frailty and dependence on the help of another person[17,21]. At the same time, inappropriate diet and eating habits, physical inactivity, and smoking habit are modifying factors that can be changed, thus reducing their effect on increasing the risk of more severe forms of COVID-19 and worsening of existing chronic diseases[11].

Regular physical activity and exercise reduce the risk of chronic cardiovascular and metabolic diseases and maintain physical and mental fitness[20]. In older people, regular physical activity and exercise and appropriate fitness maintain independence in performing daily activities and contribute to successful and healthy aging[22]. It is of particular importance during the prolonged COVID-19 pandemic. The aim of this review is to present relevant knowledge about the effects of restrictions and social distancing established with the aim of suppressing the COVID-19 pandemic on physical activity and mental health of elderly people.

Material and Methods

Electronic literature search was conducted using the PubMed, MEDLINE and Scopus database for relevant articles published from January 2020 to June 15, 2022. The search was conducted based on the following key word combinations: physical activity + elderly/institutionalized + COVID-19 + restrictions; mental health + elderly/institutionalized + COVID-19 + restrictions. Relevant articles on the examined phenomenon and the level of physical activity and mental health of the elderly in the conditions of restrictions and social distancing during the COVID-19 pandemic published in English were included. For characteristics of the level of physical activity and fitness of institutionalized elderly, as well as for recommendations regarding the necessary physical activity in the elderly, the search was expanded to include relevant sources published in the last 10 years. Exclusive criteria were age of the subjects below 65 years, and selected groups of subjects with chronic diseases (such as depression, neuromuscular and neurodegenerative diseases, mental diseases, cardiovascular and metabolic diseases).

Physical activity and mental health of the elderly in conditions of pandemic restrictions

The negative effects of social distancing on physical activity of various forms and intensities are observed soon after the introduction of restrictive measures[7,8]. Already in the first months of the pandemic, social interactions and limitation of activities are recognized as the most common challenges of restrictive measures[16]. During the pandemic, numerous authors have reported a decrease in the share of the physically active population and of those exercising regularly. The time spent in activity decreases, energy expenditure decreases, while the time spent sedentary increases[9,11,15,23-25], although the results in all segments related to physical activity are not consistent. There also are results that reveal a significant proportion of elderly people who have increased their level of physical activity during the pandemic restrictive measures[26]. In a meta-analysis by Wunsch *et al.*[6] that included 57 studies covering all age groups, 33 studies showed a significant decrease in physical activity, 14 had mixed results, and 6 showed no changes in physical activity during the pandemic. Of the seven researches that analyzed changes in physical activity in people aged 60 and over, three studies showed a significant decrease, three studies gave mixed results regarding the intensity and forms of physical activity, and one study did not observe any changes during the COVID-19 pandemic. Reviewing published articles at

the beginning of the pandemic, from the end of 2019 to the beginning of 2021, Christensen *et al.*[27] found a decrease in physical activities of all intensities and forms, which was emphasized especially in older age groups. Such observations are also supported by the results of a large observational study conducted using the IPAQ questionnaire among the Spanish population during the pandemic[28]. An interesting Japanese study by Obuchi *et al.*[13] analyzing four walking indicators, confirms a significant decrease in the number of steps compared to the pre-pandemic year, with a smaller but significant increase in walking speed, which is attributed to an increase in step length and may have protective role against adverse health effects caused by restrictions. Already after the first restrictive measures, a Dutch population cohort study in middle-aged and elderly people reports that 59% of the respondents do not meet the recommendations for physical activity[29]. During the first six weeks of lockdown, a British study in the elderly refers to the perception of a maintained pre-pandemic level of physical activity and physical function, but an increase in the time spent sitting[10]. Among German follow-up survey participants aged 78-94 years, 26% reported a decrease in the level of physical activity, and 38% a perceived decrease in the quality of life[30]. More than half of the participants (aged 68+ years) in a Swedish cross-sectional study conducted during the first wave of the COVID-19 pandemic reported a reduction in social or physical activity, and over 11% reduction in the use of health and social services[31]. In the study by Bailey *et al.*[32], over 40% of the participants with average age of 80 reported a decrease in physical activity and over 70% reported a decrease in the frequency of exercise or lack of exercise. Almost 40% of the participants in the same study reported a perception of mental health deterioration, more than half reported loneliness, and half of the respondents reported a decrease in the quality of life[32].

At the very beginning of the pandemic, in the period from October 2019 to April 2020, Makizako *et al.*[14] recorded reduction of the time spent in physical activity by more than 30% in adults and the elderly. Systematic reviews by Larson *et al.*[15] and Oliviera *et al.*[12], based on published studies during 2020 and early 2021, speak in favor of a significant reduction in physical activity in the elderly. Such a reduction in physical activity additionally increases the risk of progression of the course of non-communicable chronic diseases and thereby increases the risk of contracting severe forms of COVID-19.

Loneliness, advanced age, markers of social isolation, and symptoms of depression were found to be associated with significant reduction in physical activity during the pandemic[9]. Emerson *et al.*[33] refer to a greater proportion of women aged 60 and above who reported a decrease in physical activity and an increase in feelings of loneliness, fear, sadness, anxiety compared to men during the COVID-19 pandemic restrictions. Older women also reported more frequently being stressed, hopeless and frustrated compared to men[33]. In the Italian population of elderly people, Galle *et al.*[34] found a more frequent decrease in the level of physical activity during the pandemic in women compared to men as well. Many other studies confirm women being more susceptible to changes in physical activity behavior[30,31,35]. A Spanish study of active elderly people showed that although the level of physical activity was lower during the pandemic, active people remained active during the pandemic[19]. The results of the longitudinal study by Siltanen *et al.*[36] indicate that, regarding an active lifestyle, restrictive measures especially affect elderly people with reduced mobility. The quality of life associated with mental health seems to remain unchanged in persons with better functional abilities, whereas in those with lower functional abilities, the risk of mental health concerns is increased[19]. The study by Guedj *et al.*[37] reveals changes in the metabolism of the sensorimotor cortex in a sample of middle-aged and elderly subjects during the lockdown, and considers the possible connection of the observed changes with physical activity restrictions and social isolation during the pandemic.

In older people, the risk factors for reducing physical activity during the pandemic, in addition to age, gender, loneliness, and depression, also include living in a home without a garden or terrace[24]. Socioeconomic status and involvement in social activities and exercise programs before the pandemic positively contribute to maintaining the level of physical activity in the elderly during pandemic restrictions[38]. In physically active population, the type of exercise facility subscription had a significant impact on physical level during COVID-19 restrictions[28].

Measures of social distancing and self-isolation as staying at home in the elderly reduce habitual and programmed physical activity and increase the time spent sitting and lying down. The elderly are especially affected by this due to their lower level of physical activity, lower cardio-respiratory fitness, and

sarcopenia. Garner *et al.*[39] refer to the negative effect of restrictions imposed due to the pandemic on frailty in those aged over 70, with an increase in the risk of adverse outcomes. During the restrictive measures caused by the COVID-19 pandemic (social distancing, self-isolation), physical activity and exercise significantly contribute to the maintenance and improvement of physical and mental health. Researchers point to the protective role of a sustained level of physical activity for the development of stress-related symptoms[40,41]. Physical inactivity in the elderly contributes to reduced cognitive functions and health-related quality of life, increased risk of mortality, falls and fractures, reduced functional capacity and impairment of mental health[22]. In contrast, physical activity and exercise improve the function of the immune system, reduce the indicators of inflammation, prevent sarcopenia, and reduce the risk of more severe forms of COVID-19[42]. The study by Garcia-Esquinas *et al.*[18] showed that people with an active lifestyle and a Mediterranean diet were less likely to develop unhealthy patterns of diet and physical activity during pandemic restrictions. At one year after the introduction of restrictive measures, Camp *et al.*[43] found positive association of a higher level of self-control and self-efficacy and fewer depressive symptoms with a higher level of physical activity in middle adulthood and old age.

The results of research on the impact of restrictions introduced to combat the COVID-19 pandemic on mental health and psychiatric well-being of the elderly are not consistent. According to the results of the Survey of Health, Ageing and Retirement in European countries[44], about 28% of the participants aged 50 years and older reported mental health worsening from the beginning of the COVID-19 pandemic. It was associated with stringency of the physical distancing measures. Data from the same study used to explore longitudinal changes in mental health from the pre-pandemic year to summer 2020 reveal that elderly people had a lower risk of feeling depressed, and fewer sleeping problems, but the risk of loneliness increased as compared to the pre-pandemic period. Positive impact on mental health was attenuated in countries with stricter social distancing[45]. The results of a large cohort study conducted in an older adult population during social restrictions in the first pandemic wave showed that the restrictive measures implemented did not have a negative impact on mental health and psychiatric well-being[46].

Based on data from that European study and data from the Oxford COVID-19 Government Response Tracker for 17 countries, Garcia-Prado *et al.*[47] find that lockdown measures significantly worsen insomnia, anxiety, and depression, especially in people aged 50-65. Scoping review by Koszalinski and Olmos[48] speaks in support of increased depression and anxiety during the pandemic than in the pre-pandemic period. A narrative review by Sepulveda-Loyola *et al.*[49] involving more than 20,000 older community-living participants from Asia, Europe and America pointed to anxiety, depression, poor sleep quality, and physical inactivity as the main outcomes reported during the COVID-19 restriction measures. A Dutch population study in people with average age of 70 years reveals a higher frequency of clinically relevant symptoms of depression and anxiety, especially in women, during the pandemic than in the pre-pandemic period[50].

Physical activity of institutionalized elderly in conditions of pandemic restrictions

The levels of usual physical activity, in addition to the known factors such as age, gender, level of education, nutritional status, health and functional status, in institutionalized elderly people living in nursing homes are defined by additional factors. The population of institutionalized elderly often has a limited health and functional ability and self-care capacity[51,52]. In comparison to the community dwelling elderly, this subgroup of elderly people is characterized by a higher prevalence of chronic noncommunicable diseases, lower level of physical activity and functional ability, and consequently partial or complete dependence on another person in performing daily activities. The study by Tomas-Carus *et al.*[51] showed that compared to non-institutionalized elderly, institutionalized elderly spent less time in moderate physical activity and walking, and more in sitting, and had lower values of indicators of the physical component of the health-related quality of life as well. Physical activity was a significant predictor of the physical and mental components of the health-related quality of life. This is also supported by the study by Naushin *et al.*[52], in which compared to institutionalized elderly, the authors proved better results on the lower body strength, dynamic balance and endurance in community-dwelling elderly of the same age. Kleschnitzki *et al.*[53] showed a significant decrease in motor skills in institutionalized elderly during three months of epidemiological restriction measures.

Although the population of the elderly living in nursing homes is heterogeneous with regard to all the above-mentioned characteristics, the residents of nursing homes stay inside more often, and some of them rarely or never go outside the homes. This is necessarily reflected in the level of physical activity and changes associated with insufficient physical activity. Ikezoe *et al*.[54] report that residents of nursing homes for the aged spend more than 74% of their daily time in a sitting or lying position. Stays in the inpatient ward of the home or in the hospital further impair functional capacity. The risk of falls increases significantly upon discharge after hospitalization[55], which is associated with low physical activity. Nursing homes for the aged and infirm differ in the type of service and their facilities available to service users. Therefore, within the population of institutionalized elderly, there is heterogeneity with regard to the use of services in nursing homes (type of hotel accommodation, usual home accommodation, stationary accommodation). There is also diversity with regard to the availability of programmed physical exercise services provided by the institution.

Namely, all components of fitness improve in institutionalized elderly involved in physical exercise programs[56]. The time spent standing, standing activities, walking is positively related to physical fitness of institutionalized persons[54]. Fitness in elderly people with dementia in nursing homes is positively associated with cognitive abilities and consequently with a better quality of life[57].

Maintaining functional capacity is a prerequisite for preserving independence in institutionalized and hospitalized elderly people. The only procedure for maintaining functional abilities in the elderly is regular physical activity and exercise adapted to health and functional status. A number of studies have shown positive effects of programmed exercise in institutionalized elderly[58-60]. Physical exercise in institutionalized elderly significantly improves their functional capacity, as shown by Scarabottolo *et al*.[59] for strength of the upper and lower limbs. The interventional study by Rugbeer *et al*.[60] showed that exercise at a frequency of 3x week was more effective in improving mental component of the health-related quality of life as compared to the exercise frequency of 2x week. A systematic review and meta-analysis by Chaabene *et al*.[61] showed significant effects of home-based exercise programs on maintaining and improving muscle fitness and skill-related fitness in the elderly.

Physical activity is especially important for frail elderly. Although McIntyre *et al*.[62] in six-month follow-up during the pandemic restriction measures refer to a reduced incidence of falls in high-risk elderly, restrictions and social distancing measures during the pandemic were most often associated with deterioration of functional abilities, mobility, and risk of falls[17]. A qualitative study aimed to give insights into the perceptions of elderly living in nursing homes about exercise programs, in particular their motivation and attitudes, self-perceived health, knowledge, effects and wishes regarding exercise programs was performed by Poveda-Lopez *et al*.[63]. Among other results, the study showed the participants' desire to increase the frequency of exercise, more walking activities and outdoor exercise[63].

Conclusion

Bearing in mind the importance of physical activity and exercise for preserving functional ability, maintaining independence, physical and mental health and health related quality of life, especially during pandemic restrictions, special attention should be paid to prescribing physical activity and exercise, ensuring the conditions for its systematic implementation, especially in the institutionalized elderly. Regular physical activity and exercise are the only procedures (tools) that can prevent sarcopenia and reduction of cardiorespiratory capacity in the elderly and have an important role in the prevention and progression of a number of chronic diseases. Of particular importance is individual approach and adaptation of exercise programs to the health and functional condition of each elderly person. This can be achieved by appropriate type, modulation of volume (frequency and duration of activity/exercise) and intensity of exercise. Recommendations for reducing sedentary behavior and specific, evidence-based recommendations for exercise for certain groups of the elderly living in nursing homes have been published by the working group led by de Souto Barreto *et al*.[64]. Special emphasis has been paid to preferences and attitudes of older people towards exercise, which contributes to motivation and satisfaction with exercise. Detailed recommendations and guidelines for physical activity for healthy aging, maintenance of functional ability and optimal body composition are given by Izquierdo *et al*.[65], as well as recommendations

for prescribing exercise in the prevention of so-called geriatric syndromes, physical frailty, falls and reduced mobility, and cognitive impairments.

In unfavorable conditions such as a pandemic, it is especially valuable for personal physical and mental well-being to carry out physical activity outdoors[66]. The importance of the availability of green areas for activities and exercise in lockdown conditions is emphasized by a representative British national study by Burnett *et al.*[67]. During restrictions and social distancing, measures to maintain the recommended level of physical activity of the elderly who mostly stay at home also require the use of Internet applications for mobile phones and tablets for individual programming and conducting exercises at home.

Research is underway on the impact of restrictions during the pandemic on the physical and mental health of the elderly in nursing homes in the Croatian population. Data were collected during October and November, in the period between the third and fourth wave of the COVID-19 pandemic. We expect that the results of this research will provide answers to important questions related to the segment of a particularly sensitive part of the population, provide new and relevant knowledge about the impact of restriction measures during the pandemic on physical and mental health, necessary for planning the intervention measures that, in the event of a repeated pandemic wave, can reduce the potentially negative impacts of restrictions and social distancing in the elderly[68].

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Sažetak

UČINCI OGRANIČENJA TIJEKOM PANDEMIJE COVID-19 NA TJELESNU AKTIVNOST I MENTALNO ZDRAVLJE OSOBA STARIJE ŽIVOTNE DOBI

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Redovita tjelesna aktivnost i održavanje tjelesne spremnosti smanjuju rizik od kroničnih kardiovaskularnih i metaboličkih bolesti, smanjuju rizik od pogoršanja postojećih bolesti, održavaju tjelesno i mentalno zdravlje te kod starijih osoba doprinose zdravom i uspješnom starenju. To je od osobite važnosti tijekom dugotrajne pandemije COVID-19. Cilj ovog preglednog rada je prikazati relevantna znanja o učincima ograničenja i socijalnog distanciranja uspostavljenih u cilju suzbijanja pandemije COVID-19 na tjelesnu aktivnost i mentalno zdravlje starijih osoba. Tijekom pandemije brojni autori navode pad udjela tjelesno aktivnog stanovništva te onih koji redovito vježbaju. Smanjuje se vrijeme provedeno u aktivnosti, energetski utrošak u aktivnosti, a povećava se vrijeme provedeno u sjedećem položaju iako rezultati u svim segmentima vezanim uz tjelesnu aktivnost nisu dosljedni. Mjere ograničenja i socijalno distanciranje tijekom pandemije pogoršavaju kvalitetu spavanja, nesanicu, osjećaj usamljenosti, anksioznost i depresiju u starijih osoba, osobito žena. Tijekom restriktivnih mjera uzrokovanih pandemijom COVID-19 tjelesna aktivnost i tjelovježba značajno doprinose očuvanju i poboljšanju tjelesnog i psihičkog zdravlja.

Ključne riječi: *Tjelesna aktivnost; Vježbanje; Mentalno zdravlje; Osobe starije dobi; Ograničenja zbog COVID-19*