

# PHYSICAL ACTIVITY, MENTAL HEALTH AND QUALITY OF LIFE OF WOMEN WHO HAVE EXPERIENCED COVID-19

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## SUMMARY

Physical activity occupies an important place in maintaining and improving the health and well-being of individuals and the population, which is why physical activity stands out as an important lifestyle. The restrictive measures introduced due to the coronavirus pandemic have led to a significant drop in the level of physical activity, as well as an increase in anxiety and depression. The aim of this research was to determine whether there is a connection between physical activity, mental health and quality of life of women who have experienced COVID-19. The sample of respondents consisted of women between the ages of 20 and 60 (n=193). The IPAQ questionnaire (longer version) was used to assess physical activity. Self-assessment of mental health was determined by the longer version of the DASS questionnaire. Quality of life was assessed by the World Health Organization-WHOQOL questionnaire. Descriptive statistics parameters were calculated, and canonical correlation analysis was used to examine the relationship between the level of physical activity, mental health and quality of life. Canonical correlation analysis partially confirmed that there is an association between the level of physical activity and mental health parameters. There is no correlation between the level of physical activity and quality of life. In general, it is necessary for future research to include tests and measuring instruments in order to better understand the real effects of physical activity on mental and physical health after COVID-19 infection. For example, the use of an accelerometer in research would be important for an objective assessment of physical activity levels.

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Also, other factors that can directly or indirectly affect people's quality of life should be taken into account. Longitudinal research is necessary to examine the impact of different levels, forms and intensities of physical activity on mental health and quality of life after COVID-19 infection.

**Key words:** physical activity, COVID-19, mental health, pandemic, quality of life, health.

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## INTRODUCTION

The changes that occurred as a result of the coronavirus pandemic have completely changed the way of living and functioning. Due to the coronavirus pandemic, the entire world was forced to be in quarantine to reduce its transmission and new infections (Mattioli, Sciomer, Cocchi, Maffei & Gallina, 2020). Quarantine meant a complete absence of physical interaction, which resulted in limited social interaction with other people. It has become quite clear that a measure such as quarantine will lead to major changes in people's quality of life (Mattioli et al., 2020; Epifanio, Andrei, Mancini, Agostini, Andrea-Piombo, et al., 2021). The negative impact of quarantine on mental health is also evident (Wang, Shi, Que, Lu, Liu, Lu, et al., 2021; Bonati, Campi & Segre, 2022).

Research studies dealing with the issue of the coronavirus pandemic and its impact on mental health are still ongoing. There is mainly interest in researching the impact of the global pandemic and total lockdown on people's mental health, as well as on the level of physical activity (Ammar, Trabelsi, & Brach, 2021; Najafipour, Shojaei, Shahrokhbadi, Reza-Nasri, Movali & Shadkams, 2021; Martínez-de-Quel, Suárez-Iglesias, López-Flores, & Pérez, 2021). Ammar et al. (2021) conducted a study to determine whether quarantine or "house arrest" affects mental health and healthy lifestyles during the coronavirus pandemic. They found that the pandemic had a negative impact on mental health and emotional status, with a higher percentage of individuals experiencing psychosocial and emotional disturbances. The researchers also found that these psychological conditions were associated with unhealthy lifestyles, with a high percentage of individuals experiencing physical and social inactivity. It is evident that the coronavirus pandemic has led to certain changes in terms of healthy lifestyles (Maffoni et al., 2020).

The coronavirus is a completely new factor in causing stress reactions and psychological conditions (Kira et al., 2021). Also, other studies have confirmed that the pandemic and total lockdown lead to the manifestation of anxiety and depression (Rehman, Shahnawaz, Khan, Kharshiing, Khursheed, Gupta, Kashyap & Uniyal, 2021; Ellen et al., 2021; Liu et al., 2021). Based on the aforementioned studies, it is evident that the coronavirus pandemic has had a negative impact on

mental health. In addition to the attention focused on the impact of the pandemic on mental health, attention is also focused on the impact of the pandemic on physical activity.

When it comes to physical activity, the restrictive measures introduced due to the coronavirus have led to a significant drop in physical activity levels, as well as a worrying increase in anxiety and depression (Watson & Scott-Koontz, 2020). This is supported by a longitudinal study conducted by Najafipour et al. (2021). The research showed that the quarantine led to an increase in hypersomnia, a decrease in the level of physical activity, as well as an increase in anxiety in young men and women. Also, a longitudinal study conducted by Martínez-de-Quel et al. (2021) showed the negative impact of the pandemic together with the lockdown on the level of physical activity, sleep quality and well-being in active individuals.

And the study conducted by Mattioli et al. (2020) found that quarantine led to a drop in physical activity levels. As a consequence, there was an increase in sedentary activities (Stockwell, Trott, Tully, Shin, Barnett, Buttler et al., 2020). Stockwell et al. (2020) analyzed changes in the level of physical activity and sedentary behavior before and during the pandemic. The authors came to the conclusion that the pandemic led to a significant drop in the level of physical activity and an increase in sedentary activities.

Physical activity acts as a protective factor in preserving and improving both physical and mental health (Gualdi-Russo & Zaccagni, 2021). At a time when the world is under the influence of the pandemic caused by the coronavirus, physical activity stands out more than ever as an important factor that can contribute to improving mental health (Silmani, Paravlić, Mbarek, Bragazzi & Tod, 2020; Hassmen, Koivula & Uutela, 2000). This means that regular physical activity can improve mental health and quality of life (Rogowska, Pavlova, Kusnierz, Ochnik, Bodnar & Petrytsa, 2020; Qi, Li, Moyle, Weeks & Jones, 2020). Based on the above studies, it is believed that a higher level of physical activity can have a positive effect on mental health and quality of life after recovering from the COVID-19 infection. The aim of this research was to determine whether there is a relationship between the level of physical activity, mental health and the quality of life of women who have experienced COVID-19.

## **METHODS**

### **Sample of respondents**

This research was carried out in cooperation with the institutions of the Leskovac Health Center and the Leskovac General Hospital. The information about the respondents, which is necessary for the research, was collected based on the approval of the Request for Research by the Ethics Committees of these two health

institutions. The sample of respondents consisted of women (n=193) aged between 20 and 60 ( $47.60 \pm 11.1$ ) who were infected with COVID-19. In order to include respondents in the research, certain criteria had to be met. Therefore, inclusive and exclusive criteria were defined.

The criteria for the inclusion of respondents in the research were as follows:

- respondents did not have a severe clinical picture and were not on ventilators,
- respondents were diagnosed with the coronavirus,
- respondents were receiving home treatment,
- a maximum of four months have passed since leaving self-isolation.

The criteria for the exclusion of respondents in the research were as follows:

- respondents had a severe clinical picture and were on ventilators,
- respondents were not diagnosed with the coronavirus,
- respondents were not receiving home treatment,
- more than four months have passed since leaving self-isolation.

The respondents were fully aware of the goals and tasks of the research and voluntarily accepted to participate in the anonymous survey. The research was carried out four months after the infection with COVID-19.

### **Sample of measuring instruments**

Physical activity was determined using the International Physical Activity Questionnaire (IPAQ). This questionnaire is valid for scientific use (Craig et al., 2003; Hallal & Victoria, 2004). In this paper, a longer version of the questionnaire was used, as it investigates the level of physical activity in four different domains in more detail. Of the parameters that are important for assessing the level of physical activity, the research analyzed frequency, intensity and duration. This questionnaire is adapted for respondents aged 15 to 69. The IPAQ investigates four different domains: 1) physical activity at work; 2) physical activity and transportation; 3) physical activity in free time; 4) physical activity in the house and garden. The longer version of this questionnaire provides the researcher with a comprehensive assessment of physical activity levels under different conditions. The questionnaire provides detailed information on the duration of physical activity in all four domains. In addition to time duration, the questionnaire also analyzes how many days a week the respondent performs physical activity in all four domains. The questionnaire also investigates the intensity of physical

activity, that is, whether the activity is moderate or highly intense in all four domains.

### **Questionnaire for measuring anxiety, depression and stress**

The DASS questionnaire (Lovibond, & Lovibond, 1993) was used to assess mental health. DASS is a set of three self-report scales designed to measure the negative emotional states of depression, anxiety, and stress. It contains 41 questions, and the answers are given on a four-point scale. The DASS questionnaire was constructed to advance the process of defining, understanding, and measuring pervasive and clinically significant emotional states commonly described as depression, anxiety, and stress. Each of the three DASS scales contains 14 items, divided into subscales of 2-5 items of similar content. The depression scale assumes dysphoria, hopelessness, devaluation of life, self-deprecation, lack of interest/involvement, anhedonia, and inertia. Scores for depression, anxiety, and stress are calculated by summing the scores for the relevant items. The scale has shown good metric properties (Lovibond, & Lovibond, 1995).

### **Questionnaire for assessment of the quality of life**

Quality of life was assessed using the World Health Organization (WHO) questionnaire (WHOQOL-BRIEF). WHO developed the WHOQOL-BRIEF questionnaire based on the WHOQOL-BRIEF-100 (WHOQOL Group, 1994). Answers to each question are given on a five-point Likert-type scale. The questionnaire contains 26 questions distributed in four domains: physical health, psychological health, social relations and environment. The WHOQOL-BRIEF has satisfactory validity and reliability (WHOQOL Group, 1998).

### **Statistical data processing**

Data processing was carried out in the statistical program SPSS (v23.0, SPSS Inc., Chicago, IL, US) and in the program Statistica 8.0. For all the data obtained by testing, the basic statistical parameters were calculated:

- arithmetic mean (Mean),
- standard deviation (SD),
- minimum range (Min),
- maximum range (Max).

Discriminativeness of measurements was determined with the help of skewness and kurtosis. Canonical correlation analysis was used to examine the

relationship between the level of physical activity, mental health parameters and quality of life.

## RESULTS

Table 1. Descriptive statistics of women aged 20 to 60.

VARIABLES	Mean	SD	Min	Max	Skew	Kurt
Anxiety	9.53	8.21	0	42	1.23	1.27
Depression	8.63	8.47	0	42	1.37	1.70
Stress	14.47	8.61	0	42	0.55	0.02
Physical health	23.14	2.77	11	30	-0.63	1.90
Psychological health	20.60	2.95	11	27	-0.36	0.22
Social relationships Environment	10.81	2.09	4	15	-0.32	0.43
	27.26	4.03	17	37	0.03	-0.60
PA at work	1274.01	871.27	0	3448	0.17	-0.67
PA in transport	428.20	385.82	0	2385	1.56	4.03
PA at home	1461.55	873.33	0	4200	0.47	0.13
PA in leisure time	921.62	749.60	0	3348	0.65	0.23
PA while walking	1061.69	576.65	0	3003	0.33	0.12
Moderate PA	2237.88	1092.45	0	4920	-0.64	-0.38
Intensive PA	818.96	755.21	0	3200	0.50	-0.52
Total PA	4118.53	1422.25 MET	297	6494	-0.82	0.17

**Legend:** PA-physical activity, **Mean**-arithmetic mean, **SD**-standard deviation, **Min**-minimum range, **Max**-maximum range, **Skew**-skewness, **Kurt**-kurtosis, **MET**-metabolic equivalent.

Table 1 shows the descriptive statistics of the respondents included in the research. In terms of mental health, Stress has a higher mean value than Anxiety and Depression ( $14.47 \pm 8.61$ ). In terms of quality of life, the Environment domain has a higher mean value than Physical and Psychological health ( $27.26 \pm 4.03$ ). Further analysis showed that Moderate PA has a higher mean value than all variables within physical activity ( $2237.88 \pm 1092.45$  MET). In addition to Moderate PA, PA at home has a higher value compared to other variables within physical activity ( $1461.55 \pm 873.33$  MET). The Total PA of the respondents in this research is  $4118.53 \pm 1422.25$  MET.

By inspecting the obtained skewness values, which tells whether the results are asymmetric or not, it can be confirmed that for most variables, the skewness values are within normal limits, i.e. they do not show a tendency towards greater asymmetry of results. However, values above 1 are observed for PA in transport (1.56), Depression (1.37) and Anxiety (1.23), but they are within normal limits. By further analyzing the values, it can be concluded that for most variables, the kurtosis values are within normal limits. However, a value greater than 3 is observed only for PA in transport (4.03). By further analysis, values above 1 were found for Physical health (1.90), Depression (1.70) and Anxiety (1.27).

Table 2. Isolated canonical function.

	Canonic R	Canonic R-sqr.	Chi-sqr.	df	p
	0.40	0.16	99.90	56	<b>0.000</b>
	0.36	0.13	66.22	42	<b>0.010</b>
	0.33	0.11	40.07	30	0.104
	0.25	0.06	17.60	20	0.614
	0.13	0.01	5.36	12	0.945
	0.10	0.01	2.08	6	0.912
	0.01	0.00	0.05	2	0.974

**Legend:** **Canonical R** - maximum correlation between predictor and criterion values, **Canonical R<sup>2</sup>** - % of the common variability of the investigated areas, **Chi-sqr.** - statistical significance testing, **df** - degree of freedom, **p** - level of significance.

Table 2 shows the results of isolated factors of the canonical correlation analysis for respondents. By analyzing this table, it is clearly observed that there is statistical significance only in two canonical pairs ( $p=0.000$ ;  $p=0.010$ ).

On the first isolated canonical pair of physical activity, the highest value was achieved by the PA at home (0.82). In addition to the variable PA at home, within the first isolated canonical pair, high values were observed for Moderate PA (0.73) and Total PA (0.62). Based on this, this factor will be labeled as a factor of Physical activity at home and moderate physical activity. From the isolated first canonical pair of physical activity levels, lower values were observed for PA in transport (-0.39), PA at work (0.31), Intensive PA (0.14), PA in leisure time (0.12) and PA while walking (-0.04). On the second isolated canonical pair of physical activity levels, the highest value was achieved by the variable PA at work with a negative sign (-0.55). Based on this, this factor will be labeled as a factor of Physical activity at work and walking.

Table 3. Factor sturcture.

	Root 1	Root 2		Root 1	Root 2
PA while walking	-0.04	<b>-0.51</b>	Anxiety	-0.33	<b>-0.54</b>
Moderate PA	<b>0.73</b>	0.03	Depression	<b>-0.66</b>	-0.13
Intensive PA	0.14	-0.29	Stress	-0.30	-0.18
Total PA	<b>0.62</b>	-0.33	Physical health	-0.27	-0.22
PA at work	0.31	<b>-0.55</b>	Psychological health	0.23	0.38
PA in transport	-0.39	0.26	Social relationships	-0.13	-0.29
PA at home	<b>0.82</b>	0.25	Environment	-0.18	-0.35
PA in leasure time	0.12	-0.33			

**Legend:** Root - factor, PA - physical activity.

Within the area of mental health and quality of life in the first isolated canonical couple, depression (-0.66) achieved the highest value and with a negative sign, which means that this factor will be marked as a Depression factor. In the second isolated canonical pair, the highest value with a negative sign was achieved by anxiety (-0.54). This factor will be labeled as the Anxiety factor. These factors have negative correlations, which means that a higher level of physical activity reduces symptoms of depression and anxiety.

## DISCUSSION

Physical activity occupies an important place in maintaining and improving the health and well-being of individuals and the population, which is why physical activity stands out as an important lifestyle (Bull, Maslin & Armstrong, 2009). Numerous studies have shown that regular physical activity has a positive effect on mental health (Hamer, Stamatakis & Steptoe, 2009; Junior, Wallan-Tertuliano, Venditti-Junior, da Silva-Junior, de Oliveira-Castro & de Oliveira, 2022; Silmani, Paravlić, Mbarek, Bragazzi & Tod, 2020). Also, research shows that physical activity, in addition to mental health, can contribute to a better quality of life (Qi, Li, Moyle, Weeks & Jones, 2020).

In our study, the value of total physical activity is 4118 MET. Based on the instructions of the IPAQ questionnaire (Forde, 2018), the value of total physical



activity is greater than 3000 MET, which means that the level of physical activity of women is at a satisfactory level. It is very important to point out that a greater contribution to the value of total physical activity is given by moderate physical activity, the value of which is 2237 MET. This means that women were more active in moderate physical activities. Earlier research also showed that women are more moderately physically active (Al-Hazzaa, 2007), which is in agreement with our study.

The canonical correlation analysis in the conducted research showed that there is statistical significance in two canonical pairs. The first canonical pair, labeled as Physical activity at home and moderate physical activity, is associated with depression, while the second canonical pair, labeled as Physical activity at work and walking, is associated with anxiety. Other studies have also shown that women are more active at home than men, so it can be assumed that this is how the above results were obtained (He & Baker, 2005; Khaing-Nang, Khoo, Salim, Tai, Lee & Van-Dam, 2010). In support of this, the descriptive statistics of the conducted research showed that in addition to moderate physical activity, physical activity at home had a higher value, which is 1461 MET. This means that the women in our research study were most active in moderate physical activities and activities in home conditions, which is in agreement with previous studies (He & Baker, 2005; Khaing-Nang, Khoo, Salim, Tai, Lee & Van-Dam, 2010; Al-Hazzaa, 2007). The results of our study suggest that greater physical activity at home can have a positive effect on depression in terms of symptom reduction.

Our study showed that there is an effect of moderate physical activity in reducing depressive symptoms. These results agree with the study of Cecchini, Carriedo, Fernandez-Rio, Mendez-Gimenez, Gonzalez, Sanchez-Martinez & Rodriguez-Gonzalez (2021) who was ready for moderate activity, depression was ready for moderate activity. is during home isolation.

The authors also emphasize that it is not important whether the physical activity is carried out in the house, on the terrace, or in the garden, but it is important that the person is physically active. Also, the authors suggested that moderate physical activity should last longer than the minimum recommended duration of activity. Regarding moderate physical activity, other studies also show that it has positive effects on mental health (Lin et al. 2020; Brady, Fenton, Metsios, Bosworth, Duda, Kitas, Veldhuijzen-van Zanten, 2021; Silmani, Paravlić, Mbarek, Bragazzi & Todd, 2020). Popov, Sokić, & Stupar (2021) examined the importance of physical exercise and stress coping strategies in relation to mental health indicators (depression, anxiety and unspecified stress) in conditions of social isolation. Their research concluded that physical activity, as a moderator, reduces the level of anxiety in people who are prone to emotion-focused coping. Similar results were obtained by Hamer, Stamatakis & Steptoe (2009), which, based on a sample of 19.842 respondents of both sexes, determined that any form of daily physical activity was associated with a lower risk of psychological stress

and better mental health. Different types of activities, including domestic activities (housework, gardening), walking and sports activities, were associated with better mental health. Simply put, any physical activity, which is realized at least 20 minutes a week, is effective in preserving the mental health and well-being of people (Hamer et al., 2009). On the other hand, Borrega-Mouguinho, Sánchez-Gómez, Fuentes-García, Collado-Mateo & Villafaina (2021) came to the conclusion that high-intensity physical activity is more effective in reducing anxiety, depression and stress. However, the authors also found positive effects of moderate physical activity on mental health, i.e. concluded that even moderate physical activity reduces symptoms of anxiety, depression and stress. In any case, there are great benefits of regular exercise of any form of physical activity for mental health, regardless of the intensity (Hamer et al. 2009; Junior, et al., 2022).

By analyzing the second canonical pair, it was observed that physical activity at work, with walking, was associated with anxiety. Movement, as the biological basis of the functioning of living beings, has positive effects on physical and mental health. Heesch, Burton & Brown (2011) conducted a study to investigate whether there is an association between walking and mental health. The authors concluded that even low levels of physical activity, including walking, can have a positive effect on reducing depression and anxiety in older women. When it comes to physical activity at work, studies show that physical activity at work can have a positive effect on mental health (Cortés Denia, Isoard Gauthier, Lopez Zafra & Pulido Martos, 2022; Chu, Koh, Moy & Müller-Riemenschneider, 2014).

The conducted study did not show that there is a connection between physical activity and stress. Also, the study did not show that there is a connection between physical activity and quality of life. It is not easy to explain why our study did not show an association between physical activity and quality of life, given the complexity of quality of life itself. The very perception of the quality of life is individual, which means that there is a difference between men and women and that it is the man who participates in the improvement or deterioration of the quality of life (Vuletić & Mujkić, 2002). Also, there are some factors such as socio-economic status (Sesso, Rodriguez-Neto & Ferraz, 2003), place of living (Zagozdzon, Kolarzyk & Marcinkowski, 2011), level of education (Leung & Liu, 2011), marital status (Han, Park, Hyun-Kim, Jung-Kim & Park, 2014) and unemployment (Norström, Karin-Waenerlund, Lindholm, Nygren, Sahlén, Brydsten, 2019), which can affect the quality of life. In this research, those factors were not taken into account, which means that their potential influence should also be taken into account.

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## CONCLUSION

The results showed that there is a connection between physical activity and certain parameters of mental health, while there was no significant statistical connection between physical activity and quality of life. The conducted study showed that a higher level of physical activity leads to a reduction in the symptoms of certain parameters of mental health. In terms of quality of life, other factors that can directly or indirectly affect people's quality of life should be taken into account. Longitudinal research is necessary to examine the impact of different levels, forms and intensities of physical activity on mental health and quality of life after COVID-19 infection.

## REFERENCES

1. Ammar, A., Trabelsi, K., & Brach, M. (2021). Effects of home confinement on mental health and lifestyle behaviours during the COVID-19 outbreak: insights from the ECLB-COVID-19 multicentre study. *Biology of Sport*, 38(1), 9-21.
2. Al-Hazzaa, H. M. (2007). Health-enhancing physical activity among Saudi adults using the International Physical Activity Questionnaire (IPAQ). *Public Health Nutrition*, 10(1), 59-64.
3. Bull, F. C., Maslin, T. S., & Armstrong, T. (2009). Global physical activity questionnaire (GPAQ): nine country reliability and validity study. *Journal of Physical Activity and Health*, 6(6), 790-804.
4. Bonati, M., Campi, R., & Segre, G. (2022). Psychological impact of the quarantine during the COVID-19 pandemic on the general European adult population: a systematic review of the evidence. *Epidemiology and Psychiatric Sciences*, 31: <https://doi.org/10.1017/s2045796022000051>.
5. Brady, S. M., Fenton, S. A., Metsios, G. S., Bosworth, A., Duda, J. L., Kitas, G. D., & van Zanten, J. J. V. (2021). Different types of physical activity are positively associated with indicators of mental health and psychological wellbeing in rheumatoid arthritis during COVID-19. *Rheumatology International*, 41(2), 335-344.
6. Borrega-Mouquinho, Y., Sánchez-Gómez, J., Fuentes-García, J. P., Collado-Mateo, D., & Villafaina, S. (2021). Effects of high-intensity interval training and moderate-intensity training on stress, depression, anxiety, and resilience in healthy adults during coronavirus disease 2019 confinement: a randomized controlled trial. *Frontiers in Psychology*, 12, 643069: <https://doi.org/10.3389/fpsyg.2021.643069>.
7. Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., ... & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine & Science in Sports & Exercise*, 35(8), 1381-1395.
8. Cecchini, J. A., Carriedo, A., Fernández-Río, J., Méndez-Giménez, A., González, C., Sánchez-Martínez, B., & Rodríguez-González, P. (2021). A longitudinal study on depressive symptoms and physical activity during the Spanish lockdown. *International Journal of Clinical and Health Psychology*, 21(1), 1-9.

9. Cortés-Denia, D., Isoard-Gautheur, S., Lopez-Zafra, E., & Pulido-Martos, M. (2022). Effects of vigor at work and weekly physical activity on job stress and mental health. *Scientific Reports*, 12(1), 16025: <https://doi.org/10.1038/s41598-022-19966-z>.
10. Chu, A. H. Y., Koh, D., Moy, F. M., & Müller-Riemenschneider, F. (2014). Do workplace physical activity interventions improve mental health outcomes?. *Occupational Medicine*, 64(4), 235-245.
11. Ellen, C., Peter, V., Patrick, C., Kristine, O., Maria, R. B., Arnaud, S., ... & Laura, V. M. (2021). Meaningful activities during COVID-19 lockdown and association with mental health in Belgian adults. *BMC Public Health*, 21(1), 1-15.
12. Epifanio, M. S., Andrei, F., Mancini, G., Agostini, F., Piombo, M. A., Spicuzza, V., ... & La Grutta, S. (2021). The impact of COVID-19 pandemic and lockdown measures on quality of life among Italian general population. *Journal of Clinical Medicine*, 10(2), 289-308.
13. Forde, C. (2018). Scoring the international physical activity questionnaire (IPAQ). *University of Dublin*, 3.
14. Group, W. H. O. Q. O. L. (1994). Development of the WHOQOL: Rationale and current status. *International Journal of Mental Health*, 23(3), 24-56: <https://doi.org/10.1080/00207411.1994.11449286>.
15. Gualdi-Russo, E., & Zaccagni, L. (2021). Physical activity for health and wellness. *International Journal of Environmental Research and Public Health*, 18(15), 7823: <https://doi.org/10.3390/ijerph18157823>.
16. Han, K. T., Park, E. C., Kim, J. H., Kim, S. J., & Park, S. (2014). Is marital status associated with quality of life?. *Health and quality of life outcomes*, 12, 1-10.
17. Hassmen, P., Koivula, N., & Uutela, A. (2000). Physical exercise and psychological well-being: a population study in Finland. *Preventive Medicine*, 30(1), 17-25.
18. Hamer, M., Stamatakis, E., & Steptoe, A. (2009). Dose-response relationship between physical activity and mental health: the Scottish Health Survey. *British Journal of Sports Medicine*, 43(14), 1111-1114.
19. He, X. Z., & Baker, D. W. (2005). Differences in leisure-time, household, and work-related physical activity by race, ethnicity, and education. *Journal of General Internal Medicine*, 20(3), 259-266.
20. Heesch, K. C., Burton, N. W., & Brown, W. J. (2011). Concurrent and prospective associations between physical activity, walking and mental health in older women. *Journal of Epidemiology & Community Health*, 65(9), 807-813.
21. Hallal, P. C., & Victora, C. G. (2004). Reliability and validity of the International Physical Activity Questionnaire (IPAQ). *Medicine and Science in Sports and Exercise*, 36(3), 556-556.
22. Khaing Nang, E. E., Khoo, E. Y., Salim, A., Tai, E. S., Lee, J., & Van Dam, R. M. (2010). Patterns of physical activity in different domains and implications for intervention in a multi-ethnic Asian population: a cross-sectional study. *BMC Public Health*, 10, 1-11: <https://doi.org/10.1186/1471-2458-10-644>.
23. Júnior, N. J. L., Tertuliano, I. W., Junior, R. V., da Silva Junior, O. T., de Oliveira Castro, H., & de Oliveira, V. (2022). Any Level of Physical Activity Level Reduces Depression, Anxiety and Stress in Adults. *Lecturas: Educación Física y Deportes*, 27(292): <https://doi.org/10.46642/efd.v27i292.3402>.

24. Kira, I. A., Shuwiekh, H. A., Rice, K. G., Ashby, J. S., Elwakeel, S. A., Sous, M. S. F., ... & Jamil, H. J. (2021). Measuring COVID-19 as Traumatic Stress: Initial Psychometrics and Validation. *Journal of Loss and Trauma, 26*(3), 220-237.
25. Liu, S., Yang, L., Zhang, C., Xu, Y., Cai, L., Ma, S., ... & Zhang, B. (2021). Gender differences in mental health problems of healthcare workers during the coronavirus disease 2019 outbreak. *Journal of Psychiatric Research, 137*, 393-400: <https://doi.org/10.1016/j.jpsychires.2021.03.014>.
26. Lovibond, S. H. & Lovibond, P. F. (1993). *Manual for the Depression Anxiety Stress Scales (DASS)*. Psychology Foundation Monograph. (Available from The Psychology Foundation, Room 1005 Mathews Building, University of New South Wales, NSW 2052, Australia).
27. Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy, 33*(3), 335-343.
28. Lin, J., Guo, T., Becker, B., Yu, Q., Chen, S., Stubbs, B., ... & Zou, L. (2020). Depression is Associated with Moderate-Intensity Physical Activity among College Students during the COVID-19 Pandemic: Differs by Activity level, Gender and Gender-Role. *Psychology Research and Behavior Management, 2020*(13), 1123-1134.
29. Leung, D. S., & Liu, B. C. (2011). Lifelong education, quality of life and self-efficacy of Chinese older adults. *Educational Gerontology, 37*(11), 967-981.
30. Mattioli, A. V., Sciomer, S., Cocchi, C., Maffei, S., & Gallina, S. (2020). Quarantine during COVID-19 outbreak: Changes in diet and physical activity increase the risk of cardiovascular disease. *Nutrition, Metabolism and Cardiovascular Diseases, 30*(9), 1409-1417.
31. Maffoni, S., Brazzo, S., De Giuseppe, R., Biino, G., Vietti, I., Pallavicini, C., & Cena, H. (2021). Lifestyle Changes and Body Mass Index during COVID-19 Pandemic Lockdown: An Italian Online-Survey. *Nutrients, 13*(4), 1117: <https://doi.org/10.3390/nu13041117>.
32. Martínez-de-Quel, Ó., Suárez-Iglesias, D., López-Flores, M., & Pérez, C. A. (2021). Physical activity, dietary habits and sleep quality before and during COVID-19 lockdown: A longitudinal study. *Appetite, 158*, 105019: <https://doi.org/10.1016/j.appet.2020.105019>.
33. Najafipour, H., Shojaei Shahrokhhabadi, M., Nasri, H., Movali, E., & Shadkam, M. Effects of Quarantine due to the COVID-19 on Sleep Time, Anxiety, and Physical Activity in Adult Population: A Longitudinal Study in Kerman, Southeastern Iran. *Journal of Kerman University of Medical Sciences, 28*(3), 219-229.
34. Norström, F., Waenerlund, A. K., Lindholm, L., Nygren, R., Sahlén, K. G., & Brydsten, A. (2019). Does unemployment contribute to poorer health-related quality of life among Swedish adults? *BMC Public Health, 19*(1), 1-12.
35. Popov, S., Sokić, J., & Stupar, D. (2021). Activity matters: Physical exercise and stress coping during the 2020 COVID-19 state of emergency. *Psihologija, (00)*, 2-2.
36. Qi, M., Li, P., Moyle, W., Weeks, B., & Jones, C. (2020). Physical activity, health-related quality of life, and stress among the Chinese adult population during the COVID-19 pandemic. *International Journal of Environmental Research and Public Health, 17*(18), 6494: <https://doi.org/10.3390/ijerph17186494>.

37. Rehman, U., Shahnawaz, M. G., Khan, N. H., Kharshiing, K. D., Khurshed, M., Gupta, K., ... & Uniyal, R. (2021). Depression, anxiety and stress among Indians in times of Covid-19 lockdown. *Community Mental Health Journal*, 57(1), 42-48.
38. Rogowska, A. M., Pavlova, I., Kuśnierz, C., Ochnik, D., Bodnar, I., & Petrytsa, P. (2020). Does physical activity matter for the mental health of university students during the COVID-19 pandemic?. *Journal of Clinical Medicine*, 9(11), 3494: <https://doi.org/10.3390/jcm9113494>.
39. Stockwell, S., Trott, M., Tully, M., Shin, J., Barnett, Y., Butler, L., ... & Smith, L. (2021). Changes in physical activity and sedentary behaviours from before to during the COVID-19 pandemic lockdown: a systematic review. *BMJ Open Sport & Exercise Medicine*, 7(1): <http://dx.doi.org/10.1136/bmjsem-2020-000960>.
40. Slimani, M., Paravlic, A., Mbarek, F., Bragazzi, N. L., & Tod, D. (2020). The relationship between physical activity and quality of life during the confinement induced by COVID-19 outbreak: a pilot study in Tunisia. *Frontiers in Psychology*, 11, 1882: <https://doi.org/10.3389/fpsyg.2020.01882>.
41. Sesso, R., Rodrigues-Neto, J. F., & Ferraz, M. B. (2003). Impact of socioeconomic status on the quality of life of ESRD patients. *American Journal of Kidney Diseases*, 41(1), 186-195.
42. Vuletić, G., & Mujkić, A. (2002). Što čini osobnu kvalitetu života: Studija na uzorku Hrvatske gradske populacije. *Liječnički vjesnik*, 124(2), 64-70.
43. Wang, Y., Shi, L., Que, J., Lu, Q., Liu, L., Lu, Z., ... & Shi, J. (2021). The impact of quarantine on mental health status among general population in China during the COVID-19 pandemic. *Molecular psychiatry*, 26(9), 4813-4822.
44. Whoqol Group. (1998). Development of the World Health Organization WHOQOL-BREF quality of life assessment. *Psychological Medicine*, 28(3), 551-558.
45. Watson, A., & Koontz, J. S. (2020). Youth sports in the wake of COVID-19: A call for change. *British Journal of Sports Medicine*: <http://dx.doi.org/10.1136/bjsports-2020-103288>.
46. Zagozdzon, P., Kolarczyk, E., & Marcinkowski, J. T. (2011). Quality of life and rural place of residence in Polish women-population based study. *Annals of Agricultural and Environmental Medicine*, 18(2).

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