Special Issue Article

COVID-19, Psychological Well-being and Physical Activity Levels in Older Adults During the Nationwide Lockdown in Spain

Alejandro Carriedo, Ph.D., José A. Cecchini, Ph.D., Javier Fernandez-Rio, Ph.D., Antonio Méndez-Giménez, Ph.D.

ABSTRACT

Objective: The novel coronavirus disease (COVID-19) has forced nationwide lockdowns in many countries. As a result, most of the Spanish population had to self-isolate at home. The physical and psychological consequences of this unexpected scenario could be particularly worrisome for people older than 60 years. This study is aimed to examine the psychological well-being of older adults during the home isolation due to the COVID-19 pandemic and to investigate whether meeting the World Health Organization's global recommendations on physical activity (PA) for health is associated with their resilience, affect, and depressive symptoms. *Design, setting, and participants:* In this cross-sectional study, a total of 483 citizens whose ages ranged from 60 to 92 years (overall sample: M = 65.49, SD = 5.14) were recruited via a snowball sampling strategy to answer to an online questionnaire. *Measurements:* The four instruments used were The Connor-Davidson CD-RISC resilience scale, The Positive and Negative Affect Schedule, *the six-item self-report scale of* Depressive Symptoms, *and* The international Physical Activity Questionnaire. *Results:* Results showed that older adults who regularly engaged in vigorous (VPA) and moderate-vigorous physical activity (MVPA) during the quarantine reported higher scores in resilience (Locus, Self-efficacy, and Optimism), positive affect, and lower in depressive symptoms. *Conclusion:* These finding are the first quantitative evidence pointing toward a link between engagement in VPA and/or MVPA and resilience, positive affect, and depressive symptoms within the COVID-19 restrictions in Spain. Acknowledging these associations may be important in developing health promotion programs for older people during the remaining period of confinement or future ones. (Am J Geriatr Psychiatry 2020; 28:1146−1155)

INTRODUCTION

The first case of coronavirus (COVID-19) was reported in Wuhan, China, in December 2019 and the new disease began to sharply increase in Asia and Europe. On March 11, 2020, the World Health Organization (WHO) declared the outbreak of a pandemic. Since the first confirmed case, the world has seen more than 20.3 million COVID-19 infections, and more than 741.723 people have died (as of August 12, 2020).[1] The risk of severe disease following infection from this virus is particularly worrisome for people older than 60 years, who represent more than 95% of deaths in the European Region.[2] Consequently, the WHO has emphasized the need to protect, care and support older populations.

Epidemiological experts agree that quarantine can be a protective measure to fight the sharp rise in coronavirus infections. On May, 2020, more than 1/3 of humanity was under some form of lockdown, and specifically, the population in Spain self-isolated at home for six weeks. The shelter-in-place order implies a radical change in the lifestyle of the population and could have a considerable psychological impact.[3,4]

Since the outbreak of the COVID-19 situation, authors have drawn attention to different mental health indicators such as anxiety, depression, and stress.[5−7] Poor mental health and well-being is a significant cause of disease, with depression considered a principal contributor.[8] The negative psychological effects of being confined during a quarantine have been recently reviewed,[3] including post-traumatic stress symptoms, confusion, anger, emotional disturbance, depression, stress, low mood, irritability, insomnia, anxiety, and irritability. In this context, special attention should be given to the elderly population because older individuals are at a significantly increased risk of severe disease.[2] In this regard, a recent study has found that people aged 60 years or above had a higher likelihood of depression and poor health-related quality of life during the ongoing pandemic, especially those who had suspected COVID-19 symptoms.[6]

Resilience is a term positively related to mental health[9] that could be of special relevance during the COVID-19 pandemic.[10] It has been defined as "the interactive and dynamic process of adapting, managing, and negotiating adversity."[11] Recent cross-sectional studies on COVID-19 have revealed a prevalence of mental health disturbances in health professionals[12,13] and other populations.[14,15] In this regard, theory suggests that resilient individuals would be more likely to bounce back from negative experiences quicker and effectively.[16] Related research has shown that resilience is negatively associated with anxiety and depressive symptoms,[17] positively associated with more positive emotions in stressful situations,[16] and also with more emotional flexibility in response to a changing stressful psychological task.[7]

With the aim of dealing better with the potential psychological problems of older people involved in the COVID-19 epidemic restrictions, new questions have raised. For example, is the elder population facing properly this confinement? What strategies could help them to maximize physical and psychological well-being? In this context, physical activity (PA) might provide older people with an advantage for overcoming this situation. On the one hand, accumulated evidence has shown that PA is relevant to all healthy adults and that it is an effective therapy for most of the chronic diseases with direct effects on physical and mental health.[4,18] On the other hand, it has been indicated that PA impacts positively on mood[19] and affect.[20] It may also have beneficial effects on depressive symptoms[21,22] and may prevent depression promoting social support or resilience.[23] Unfortunately, the optimal type (e.g., aerobic, strength) and dose (e.g., duration, frequency, intensity and/or volume) remains uncertain.[24] In this regard, the WHO[18] recommends that people over 60 years should participate in 150 min/week of moderate-intensity (MPA), or 75 min/week of vigorous-intensity (VPA), or an equivalent combination of both (MVPA) for health enhancement and prevention of noncommunicable diseases. However, the shelter-in-place order could have led to restrictions in the PA behavior of older adults.

So far, the literature reviewed during the COVID-19 pandemic suggests that PA is linked to individuals' mental health.[25−27] However, to date, the associations between resilience, affect, depressive symptoms, and PA during the quarantine in the elder population is unknown. Hence, it seems important to understand how the preventive measures against the outbreak of the COVID-19 may affect psychological well-being of older people that are home isolated during the ongoing pandemic. Based on the aforementioned, this

study aimed to asses resilience, affect, depressive symptoms, and PA levels during the COVID-19 pandemic in Spanish older adults; and to evaluate the relationship between their psychological well-being and meeting the WHO'S[18] recommendations on VPA, MVPA, and MVPA.

METHODS

Participants

The sample comprised 483 older adults from Spain (237 males and 246 females) whose ages ranged from 60 to 92 years (overall sample: $M = 65.49$, $SD = 5.14$; males: 66.03, $SD = 5.54$; females: 64.98, $SD = 4.67$).

Procedure

Firstly, the researchers' State Ethics Committee approved the study. Then, an online questionnaire was developed by the research team. The questionnaire was distributed through the press, television, and different social networks (e.g., e-mail, WhatsApp, YouTube, Twitter, Instagram, and Facebook) via a nonprobability snowball sampling strategy focused on recruiting people aged 60 or above living in Spain during the COVID-19 outbreak. It has been shown that online snowball surveys are very effective to contact participants from different places and that the response rate is higher than in other strategies.[28] Participants were informed that their responses would be kept anonymous and that they had the right to withdraw from the study at any time because participation was voluntary. Thus, informed consent was obtained from all participants. All survey responses were collected during the three first weeks of the mandatory confinement. The total reach of the study is unknown. The snowball sampling and the media coverage cannot provide this kind of information, which could have been useful to better understand the sample characteristics. In order to reduce the attrition rate, the survey was developed to be completed between 5 and 8 minutes.

Instruments and Measures

Resilience was assessed using *The Connor-Davidson CD-RISC resilience scale*[29] adapted to Spanish.[30] This

self-report questionnaire includes 15 items related to the ability to face adversity grouped in three factors: Locus of Control (e.g., "I am in control of my life"), challenge of behavior orientated towards action and Self-efficacy (e.g., I am not easily discouraged by failure"), and Optimism (e.g., "I can stay focused under pressure"). Participants responded to the stem "Indicate to what extent you feel right now" in a Likert Scale ranged from 1 (*completely disagree*) to 4 (*completely agree*). This instrument has shown adequate psychometric properties in general population.[29] In this study, Cronbach alpha were 0.79 (Locus), 0.90 (Self-efficacy), and 0.82 (Optimism).

The Positive and Negative Affect Schedule[31] is a 20-item scale divided in two subscales: Positive Affect (10 items, e.g., enthusiastic, inspired, proud...), and Negative Affect (10 items, e.g., irritable, upset, afraid...). The Spanish validated version by López-Gómez et al.[32] was used. Both subscales were rated on a 5 point Likert scaler anchored by 1 (*not at all*) and 5 (*strongly*). In this study, Cronbach alpha were 0.89 (Positive Affect), and 0.82 (Negative Affect).

Depressive symptoms were assessed using an adaptation of the six-item self-report scale developed by Kandel and Davies[33] that measures depressive symptoms during the past 12 months.[34] In this investigation, participants responded to the preface "During the last week, how often have you...?" They had to indicate whether the situation (e.g., "...felt nervous or tense") occurred "*never*" (1), "*rarely*" (2), "*sometimes*" (3), or "*often*" (4). Participants' scores were increased in 10 points to produce a range between 16 and 34 points. A score of 29 or greater was considered as showing notable depressive symptoms.[33] Cronbach's alpha for the entire scale was 0.83.

Physical activity and sedentary behavior: The *international Physical Activity Questionnaire* (IPAQ)[35] was developed for cross-national monitoring of PA and inactivity. In the present study, the Spanish adaptation of the short form, 7-day recall,[36] was used (obtained at www.ipaq.ki.se). This is an appropriate outcome measure for clinical and research use with acceptable measurement properties for monitoring PA levels in different populations.[35] This version provides information about the time spent involved in three PA intensity levels: (a) walking, (b) moderate, and (c) vigorous. It also includes the time spent performing sedentary activities. On the one hand, moderate (MPA), vigorous (VPA) and moderate-vigorous

(MVPA) physical activity levels were analyzed to find out whether older adults met the WHO[18] recommendations on PA. On the other hand, walking (identified as Light PA [LPA]) and sedentary behavior were also analyzed to detect whether older adults met the recommendations for health proposed in several reviews.[37,38]

Other measures included in the analyses were age; sex; and participant's body mass index (BMI) = weight (kg)/[height (m)],[2] considering the categories underweight (<18.5), normal weight (18.5−24.9), overweight (25.0−29.9), and obese (≥30.0).

Data Analysis

All data were analyzed using SPSS version 24.0 (IBM Co. LTD, Chicago, IL). Lilliefors-corrected Kolmogorov-Smirnov test showed that all variables were non-normally distributed. Three groups were created according to global recommendations on PA for health in older adults:[18] a) whether or not individuals meet the recommended levels of 75 minutes of VPA throughout the week; b) whether or not individuals meet the recommended levels of 150 minutes of MPA throughout the week; c) whether or not individuals meet the recommended levels of 150 minutes of MVPA throughout the week. The extent to which LPA contributes to health in older adults is unknown.[39] Likewise, no quantitative guidelines exist for sedentary behavior.[37] Since the WHO did not set any quantitative recommendation on LPA and sedentary behavior that should be met for global health, the scientific literature on this topic has been reviewed to analyze LPA and sedentary behavior. Thus, two groups were also established based on: a) whether or not individuals meet the recommendations on LPA for health in older adults described by Loprinzi et al.[37] (i.e., 300 minutes/week); e) whether or not individuals meet the recommendations of less than 8 hours per day of sedentary activity described by Chau et al.[38]

The Mann-Whitney U test and the chi-square test (x^2) were used to assess between-group differences. Descriptive statistics included size (n) and frequency (%) for categorical variables. Results were considered significant at p <0.05. The effect size estimates were calculated following the recommendations described by the American Statistical Association.[40] Thus, the effect size for the Mann-Whitney U test was calculated as the r proposed by Cohen.[41] Cohen's conventional criteria for r are: small effect = 0.1, medium effect = 0.3, and a large effect = 0.5. Additionally, Cramer's V was used to show the effect size in the chi-squared test. Cohen's[41] guidelines indicated that the magnitude of effect sizes depends on the df. Thus, with one df the effect size is considered small ($r = 0.10$), medium ($r = 0.30$), and large ($r = 0.50$). Likewise, when there are three df the magnitude of effect size are small ($r = 0.06$), medium ($r = 0.17$), and large ($r = 0.29$). Additionally, different logistic regression models were constructed. The dependent variable was whether or not older adults met the recommended levels of PA (MPA, VPA, and MVPA); and those variables that were significant in the previous analyses were introduced as predictor variables. Logit link function was used for the logistic regression. To build the logistic regression model, all the factors and covariates were incorporated until no additional improvement of the model was obtained.

RESULTS

Between-Group Differences

Table 1 shows differences according to the WHO recommendations on VPA, MVPA, and MVPA (whether or not they were met), and sex, age, BMI, Depressive symptoms, Resilience (Locus, Self-efficacy, Optimism), and Affect (positive and negative). The results showed no differences in personal variables (i.e., age [Mann-Whitney U test]), sex, and BMI [x^2]). However, group differences were detected in the indicators of psychological well-being (See Table 1; i.e., resilience, affect, and depressive symptoms [Mann-Whitney U test]). The effect size was small in all variables. It was slightly higher in the three variables that measured resilience in those individuals who followed the VPA recommendations.

Older adults who met the MVPA health guidelines showed similar outcomes. However, the effect size was smaller in all resilience factors and higher in positive affect. Finally, meeting the MPA recommendations showed lower associations with psychological well-being in older adults (only with positive affect, whose effect size was small).

GLM for binary response analyses showed that the only variable that showed a predictive value for VPA

TABLE 1.   Differences According to Whether Older Adults Meet the WHO's Global Recommendations on Physical Activity for Health

	VPA				MPA				MVPA			
	No	Yes	p	ES	No	Yes	p	ES	No	Yes	p	ES
Sex n (%) x^2												
Female	203 (52.6)	40 (43.0)	0.097	0.08	174 (51.3)	72 (50.0)	0.790	0.01	149 (51.79)	94 (49.2)	0.589	0.02
Male	183 (47.4)	53 (57.0)			165 (48.7)	72 (50.0)			139 (48.3)	97 (50.8)		
Age $M(SD)$ U	65.53 (5.51)	65.49 (4.91)	0.800	0.01	65.40 (5.33)	65.71 (4.68)	0.134	0.07	65.40 (5.33)	65.71 (4.87)	0.153	0.07
BMI n (%) x^2			0.680	0.04			0.247	0.07			0.088	0.08
Underweight	4 (1.1)	0 (0.0)			4 (1.2)	0 (0.0)			4 (1.4)	0 (0.0)		
Normal or healthy weight	168 (45.5)	43 (47.3)			143 (43.7)	71 (50.4)			115 (41.5)	96 (51.3)		
Overweight	141 (37.8)	36 (39.6)			125 (38.2)	53 (37.6)			112 (40.4)	65 (34.8)		
Obese	60 (16.1)	12 (13.2)			55 (16.8)	17 (12.1)			46 (16.6)	26 (13.9)		
Depressive symptoms $M(DT)$ U	21.79 (4.12)	20.59 (3.66)	0.014	0.11	21.77 (4.18)	21.05 (3.70)	0.127	0.07	21.96 (4.23)	20.94 (3.71)	0.016	0.11
Resilience $M(DT)$ U												
Locus	2.87 (0.64)	3.05 (0.71)	0.003	0.14	2.86 (0.65)	2.98 (0.65)	0.079	0.08	2.86 (0.64)	2.98 (0.78)	0.035	0.10
Self-efficacy	2.88 (0.57)	3.02 (0.69)	0.002	0.15	2.89 (0.59)	2.94 (0.58)	0.444	0.03	2.86 (0.57)	2.96 (0.63)	0.049	0.09
Optimism	2.86 (0.60)	3.04 (0.70)	0.001	0.15	2.88 (0.61)	2.93 (0.63)	0.417	0.04	2.84 (0.59)	2.96 (0.66)	0.036	0.10
Affect $M(DT)$ U												
Positive	3.02 (0.73)	3.28 (0.91)	0.028	0.10	3.01 (0.77)	3.23 (0.72)	0.019	0.11	2.95 (0.74)	3.27 (0.80)	0.001	0.20
Negative	1.79 (0.60)	1.71 (0.68)	0.198	0.06	1.79 (0.60)	1.76 (0.62)	0.644	0.02	1.80 (0.62)	1.73 (0.61)	0.277	0.06

Note. BMI, body mass index; df, 1 in all cases except for BMI = 3; ES, effect size; MPA, moderate physical activity; MVPA, moderate-vigorous physical activity; n, sample size, (%), percentage; SD, estándar deviation; U, the Mann-Whitney U test; VPA, vigorous physical activity; x^2, chi-square test.

TABLE 2.   Generalized Linear Models for the WHO's Global Recommendations on Physical Activity for Health

	Model 1 VPA		Model 2 MPA		Model 3 MVPA	
	OR (95%CI)	p	OR (95%CI)	p	OR (95%CI)	p
Depressive symptoms	0.774 (0.642−0.934)	0.014	–	–	–	–
Locus	–	–	–	–	–	–
Self-efficacy	–	–	–	–	–	–
Optimism	–	–	–	–	–	–
Positive affect	–	–	1.177 (1.008−1.373)	0.040	−1.287 (1.176−1505)	0.001

Note. MPA, moderate physical activity; MVPA, moderate-vigorous physical activity; OR, odds ratio; VPA, vigorous physical activity.

was depressive symptoms, and that positive affect was the only variable in MPA and MVPA (Table 2).

Table 3 shows the differences according to whether or not individuals met the recommendations on LPA and sedentary behavior. The results showed differences in sex (for LPA and sedentary behavior) and in BMI (for LPA). No significant differences were observed in the remaining variables.

DISCUSSION

The main goal of this study was to assess the psychological well-being of older adults during the home isolation due to the COVID-19 pandemic and to explore whether meeting the WHO's[18] global

recommendations on PA for health was associated with their resilience, affect, and depressive symptoms. The results indicated that older adults who met the global recommendations on VPA and MVPA had higher levels of resilience (locus of control, self-efficacy, and optimism), higher positive affect, and lower depressive symptoms. Although both VPA and MVPA showed similar outcomes, the effect size detected was higher in all resilience factors for VPA and higher in positive affect for MVPA. In this regard, meeting the minimum MPA levels was associated only with positive affect. It should be noted that no significant difference in sex, age, or BMI was detected.

These results suggest that those older adults who met the WHO's recommendations on VPA and

TABLE 3.   Differences According to Whether Older Adults Meet the Recommendations on Light Physical Activity and Sedentary Behavior

	LPA				Sedentary Behavior			
	No	Yes	p	ES	No	Yes	p	ES
Sex n (%) x^2								
Female	137 (44.5)	109 (52.6)	0.000	0.17	93 (65.6)	150 (44.9)	0.000	0.18
Male	171 (55.5)	65 (37.5)			51 (35.4)	184 (55.1)		
Age M(SD) U	65.58 (5.15)	65.36 (5.15)	0.541	0.03	65.83 (5.52)	65.40 (4.99)	0.573	0.03
BMI n (%) x^2			0.042	0.09			0.080	0.08
Underweight	3 (1.0)	1 (0.6)			1 (0.7)	3 (0.9)		
Normal or healthy weight	122 (40.9)	92 (54.4)			73 (52.1)	138 (42.7)		
Overweight	122 (40.9)	56 (33.1)			53 (37.9)	124 (38.4)		
Obese	51 (17.1)	20 (11.8)			13 (9.3)	58 (18.0)		
Depressive symptoms M(SD) U	21.39 (3.99)	21.84 (4.17)	0.273	0.05	21.64 (4.17)	21.51 (4.02)	0.801	0.01
Resilience M(SD) U								
Locus	2.88 (0.66)	2.96 (0.63)	0.365	0.04	2.94 (0.70)	2.90 (0.64)	0.404	0.04
Self-efficacy	2.89 (0.61)	2.92 (0.55)	0.904	0.01	2.90 (0.62)	2.91 (0.58)	0.829	0.01
Optimism	2.90 (0.64)	2.89 (0.57)	0.540	0.03	2.84 (0.66)	2.92 (0.61)	0.118	0.07
Affect M(SD) U								
Positive	3.04 (0.80)	3.13 (0.69)	0.325	0.04	2.84 (0.65)	2.92 (0.61)	0.587	0.03
Negative	1.78 (0.61)	1.78 (0.61)	0.988	0.00	1.80 (0.62)	1.76 (0.61)	0.453	0.04

Note. BMI, body mass index; df, 1 in all cases except for BMI = 3; ES, effect size; LPA, light physical activity; n, sample size; (%) = percentage; *SD*, standard deviation; x^2, chi-square test; *U*, the Mann-Whitney *U* test.

MVPA might cope better the demands of the shelter-in-place order. Moreover, the results indicated that they felt more optimistic about this situation. This is important because resilience has been linked to positive emotions in stressful situations,[16] overall well-being,[42] life satisfaction,[43] self-rated health[44] and better quality of life (physical and psychological) in older adults.[17] The importance of promoting resilience in the medical staff during the COVID-19 pandemic has been highlighted,[10] but also the general population should be resilient during these tough days. It has been suggested that regular PA could be a way of promoting resilience to stress in healthy adults.[45,46] In line with this idea, the results of the present study indicated that resilience was higher among participants who reached the minimum VPA and MVPA per week.

Older adults who met the VPA and MVPA recommendations also scored higher in positive affect and lower in depressive symptoms. It has been reported that performing PA has a beneficial effect on affect[20] and on positive mood,[19] and Yoshikawa et al.[23] suggested that PA practice may have effects similar to those of resilience. The scientific literature also showed that PA is effective to reduce depressive symptoms in different populations.[22,47] The results from the present study are also consistent with related research indicating that PA plays an important role in the relationship between resilience and depression in older adults.[9,23]

Perhaps the most important finding of the present study was that it was the VPA intensity which better predicted depressive symptoms, which is consistent with previous research[21] and with a very recent study that has assessed depression, anxiety and PA levels in North America under current social distancing guidelines during the COVID-19 pandemic.[25] Callow et al.[25] found that LPA and VPA levels were independent contributors towards depression symptoms in older adults. These results are consistent with the findings of this study, except for the nonsignificant association of LPA with depressive symptoms. This difference might be due to the different scales used or the different protective measures set in each country or the lack of consensus on the minimum recommendations on LPA for health in older adults.[37,39] Nevertheless, it looks like higher levels of PA (especially VPA) may help alleviate some of the negative mental health symptoms experienced by older adults while

isolation guidelines are followed during the COVID-19 pandemic.[25] Moreover, VPA showed the highest effect sizes in all health outcomes, especially for all the resilience components. Additionally, positive, but not negative affect, has been linked to all PA intensities (with small effect sizes). This could be considered important, because a positive mood during the quarantine-related stress context may serve as a protective element, decreasing the possibilities of developing a disease[45] or depression,[48] Interestingly, MPA was associated with positive affect (small effect size), indicating that moderate intensities could be enough to experience a positive mood. However, the highest effect size was observed in the association between MPVA and positive affect. Subsequent analyses on LPA indicated that meeting the recommendations of 300 min/week of LPA[37] was not enough to experience positive mood. Likewise, the analyses of this PA intensity showed that meeting such recommendations were not associated with any resilience factor or depressive symptoms. As aforementioned, this outcome differs from a recent study conducted in North America.[25] The same results were observed when it comes to sedentary behavior recommendations of less than 8 hours.[38] However, these results should be interpreted cautiously, because it is unknown how much sedentary behavior is harmful to Health[38] or how much LPA contributes to global health.[37,39] Hence, in this study, the psychological variables only were associated with the minimum PA levels recommended by the WHO, especially for VPA. When it comes to resilience and depressive symptoms, vigorous intensities produced higher effect sizes. Although the effect sizes detected in this study were small, they are of theoretical interest because this is the first quantitative study that has analyzed these variables together in this context. Moreover, there is no other empirical study to compare and other factors (e.g., chronic diseases, context) could have influenced the participants' behavior.

CONCLUSIONS

This is the first investigation on the COVID-19 epidemic exploring whether meeting or not the WHO's[18] global recommendations on PA for health is associated with resilience, affect, and depressive symptoms. Our results revealed the connection of PA with older

adults' resilience, affect, and depressive symptoms. Therefore, engaging older people in minimum levels of VPA or MVPA per week could be a protective measure for their psychological well-being during confinement. Performing any PA could be especially important during quarantine. It is advisable that those not meeting the recommendations for VPA or MVPA during their confinement should increase duration, frequency and intensity of their PA in order to achieve psychological well-being benefits. Having high resilience and positive affect seems to be quite important during this stressful situation. Individuals with negative affect could be more exposed to develop psychological problems like depression.[49]

The results of this study are consistent with a large body of research that has shown that exercise is beneficial for mental health, reducing anxiety, depression, and negative mood.[48] To maintain physiological function of most of body organs could contribute to the fight against the severe mental and physical consequences of COVID-19.[4] It should be also considered that experts have warned that mandatory shelter-in-place orders like the ones issued in many different countries due to COVID-19 could be repeated in the future. Therefore, national authorities should consider these findings to develop guidelines and/or intervention programs that may enhance the psychological well-being of older people promoting PA while in confinement.

The present study must also acknowledge some limitations, which do not alter the significance of the results. The first one is that only involved citizens from one country and no exclusion criteria were considered (e.g., chronic diseases). Thus, future works might analyze the differences between older people from different countries and with chronic diseases. Secondly, PA levels and psychological well-being indicators were measured using a self-report questionnaire using a cross-sectional design. This study began during the pandemic. Therefore, other limitation is that there was no time to validate the scales and measures for their use with older adults in an online format. In this regard, due to the sampling strategy, representativeness of the sample is not guaranteed. Additionally, information about the attrition rate could have been useful to determine the total reach of the advertisement and the characteristics of the sample. Finally, given the cross-sectional design

of this study, no causal relationships can be derived from the results and there was no correction for multiple comparisons which could have increased the Type I error rate. For instance, individuals with poor mental health symptoms and resilience could have been less prompted to exercise. Therefore, longitudinal data could provide evidence to assess the effect of PA on the mental well-being of older adults during home isolation. In this regard, it could have also been very interesting to ask participants if their PA levels changed during the lockdown. Unfortunately, we did not include this information, and it could be considered another limitation, because it is not possible to determine if the COVID-19 has led to changes in PA levels or mental health symptoms. This could be considered in similar works in the future. These limitations should be taken into consideration when considering the generalizability of our results and when designing future works, which could uphold or refuse the findings of the present study.

AUTHORS' CONTRIBUTIONS

AC made substantial contributions to conception and design of the study, was responsible for the acquisition and curation of data, and drafted the manuscript. *JAC* made substantial contributions to conception and design of the study, was responsible for the analysis and interpretation of data, critically reviewed and revised the initial draft, and approved the final version of the submitted manuscript. *JF* made substantial contributions to conception and design of the study, was responsible for the acquisition of data, critically reviewed and revised the initial draft, and approved the final version of the submitted manuscript. *AM* made substantial contributions to conception and design of the study, was responsible for the acquisition of data, critically reviewed and revised the initial draft, and approved the final version of the submitted manuscript.

DISCLOSURE

The authors report no conflicts with any product mentioned or concept discussed in this article.

References

1. Johns Hopkins University. *Coronavirus Resource Center*. [web site] August 12, 2020. Retrieved at https://coronavirus.jhu.edu/. Accessed August 12, 2020

2. World Health Organization: *Statement − Older People are at Highest Risk from COVID-19, but All Must Act to Prevent Community Spread*. WHO Regional Office for Europe, 2020. Available at: http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/statements/statement-older-people-are-at-highest-risk-from-covid-19,-but-all-must-act-to-prevent-community-spread. Accessed April 21, 2020

3. Brooks SK, Webster RK, Smith LE, et al: The psychological impact of quarantine and how to reduce it: rapid review of the evidence. Lancet 2020;doi:10.1016/S0140-6736(20)30460-8

4. Jiménez-Pavón D, Carbonell-Baeza A, Lavie CJ: Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: special focus in older people. Prog Cardiovasc Dis 2020;doi:10.1016/j.pcad.2020.03.009

5. Duan L, Zhu G: Psychological interventions for people affected by the COVID-19 epidemic. Lancet Psychiat 2020;doi:10.1016/S2215-0366(20)30073-0

6. Nguyen HC, Nguyen MH, Do BN, et al: People with suspected COVID-19 symptoms were more likely depressed and had lower health-related quality of life: the potential benefit of health literacy. J Clin Med 2020; 9:965

7. Waugh CE, Thompson RJ, Gotlib IH: Flexible emotional responsiveness in trait resilience. Emotion 2011; 11:1059–1067

8. Vigo D, Thornicroft G, Atun R: Estimating the true global burden of mental illness. Lancet Psychiat 2016; 3:171–178

9. Wermelinger MP, Corrêa JC, Lucchetti AL, et al: The role of physical activity in the association between resilience and mental health in older adults. J Aging PhysActiv 2018; 26:248–253; doi:10.1123/japa.2016-0332

10. Shaw SC: Hopelessness, helplessness and resilience: the importance of safeguarding our trainees' mental wellbeing during the COVID-19 pandemic. Nurse Educ Pract 2020; 44:102780; doi:10.1016/j.nepr.2020.102780

11. Goodman DJ, Saunders EC, Wolff KB: In their own words: a qualitative study of factors promoting resilience and recovery among postpartum women with opioid use disorders. BMC Pregnancy Childb 2020; 20:178

12. Kang L, Ma S, Chen M, et al: Impact on mental health and perceptions of psychological care among medical and nursing staff in Wuhan during the 2019 novelcoronavirus disease outbreak: a cross-sectional study. Brain Behav. Immun 2020; 87:11–17

13. Tan BYQ, Chew NWS, Lee GKH, et al: Psychological impact of the COVID-19 pandemic on health care workers in Singapore. Ann. Intern. Med 2020; 173:317–320

14. Cao W, Fang Z, Hou G, et al: The psychological impact of the COVID-19 epidemic on college students in China. Psychiatry Res 2020:112934

15. Wang C, Pan R, Wan X, et al: A longitudinal study on the mental health of general population during the COVID-19 epidemic in China. Brain Behav Immun 2020; 87:40–48

16. Tugade MM, Fredrickson BL: Resilient individuals use positive emotions to bounce back from negative emotional experiences. J Pers Soc Psychol 2004; 86:320–333

17. Gerino E, Rollè L, Sechi C, et al: Loneliness, resilience, mental health, and quality of life in old age: a structural equation model. Front. Psychol 2017; 8:2003;doi:10.3389/fpsyg.2017.02003

18. World Health Organization: *Global Recommendations on Physical Activity for Health*. Switzerland: WHO Press, 2010. Available

at: http://apps.who.int/iris/bitstream/10665/44399/1/9789241599979_eng.pdf. Accessed April 22, 2020

19. Silverman MN, Deuster PA: Biological mechanisms underlying the role of physical fitness in health and resilience. Interface Focus 2014; 4:20140040

20. Liao Y, Shonkoff ET, Dunton GF: The Acute relationships between affect, physical feeling states, and physical activity in daily life. A review of current evidence. Front Psychol 2015; 6:1975;doi:10.3389/fpsyg.2015.01975

21. Cecchini JA, Fernández-Río J, Méndez-Giménez A, et al: A self-determination approach to the understanding of the impact of physical activity on depressive symptoms. Stress Health 2017; 33:600–607

22. Cooney GM, Dwan K, Greig CA, et al: Exercise for depression. Cochrane Database Syst Revs 2013; 2(9):CD004366; doi:10.1002/14651858.CD004366.pub6

23. Yoshikawa E, Nishi D, Matsuoka YJ: Association between regular physical exercise and depressive symptoms mediated through social support and resilience in Japanese company workers: a cross-sectional study. BMC Public Health 2016; 16:553

24. Teychenne M, White RL, Richards J, et al: Do we need physical activity guidelines for mental health: what does the evidence tell us? Ment Health Phys Act 2020; 18:100315

25. Callow D D, Arnold-Nedimala NA, Jordan LS, et al: The mental health benefits of physical activity in older adults survive the COVID-19 pandemic. Am J Geriat Psychiat 2020. https://www.ajgponline.org/article/S1064-7481(20)30400-0/fulltext

26. Maugeri G, Castrogiovanni P, Battaglia G, et al: The impact of physical activity on psychological health during Covid-19 pandemic in Italy. Heliyon 2020: e04315

27. Zhang Y, Zhang H, MaX Di Q: Mental health problems during the COVID-19 pandemics and the mitigation effects of exercise: a longitudinal study of college students in China. Int J Env Resp Pub He 2020; 17:3722

28. Baltar F, Brunet I: Social research 2.0: virtual snowball sampling method using Facebook. Internet res 2012; 22:57–74

29. Connor KM, Davidson JR: Development of a new resilience scale: the connor−davidson resilience scale (CD−RISC). Depress Anxiety 2003; 18:76–82;doi:10.1002/da.10113

30. Olmo M, Olmedo E, Cepero M, et al: Validation of resilience scale (CD-RISC) in elite athletes through a structural equation model. Retos 2017; 32:96–100

31. Watson D, Clark LA, Tellegen A: Development and validation of brief measures of positive and negative affect: the PANAS scales. J Pers Soc Psychol 1988; 54:1063–1070;doi:10.1037//0022-3514.54.6.1063

32. López-Gómez I, Hervás G, Vázquez C: Adaptación de la "Escalas de afecto positivo y negativo" (PANAS) en una muestra general española. Psicol Conductual 2015; 23:529–548

33. Kandel DB, Davies M: Epidemiology of depressive mood in adolescents: an empirical study. Arch Gen Psychiatry 1982; 39:1205–1212;doi:10.1001/archpsyc.1982.04290100065011

34. Choi WS, Patten CA, Gillin JC, et al: Cigarette smoking predicts development of depressive symptoms among US adolescents. Ann Behav Med 1997; 19:42–50;doi:10.1007/BF02883426

35. Booth ML: Assessment of physical activity: an international perspective. Res Q Exerc Sport 2000; 71:114–120;doi:10.1080/02701367.2000.11082794

36. Craig CL, Marshall AL, Sjöström M, et al: The IPAQ consensus group and the IPAQ reliability and validity study group.

International physical activity questionnaire (IPAQ): 12-country reliability and validity. Med Sci Sports Exerc 2003; 35:1381–1395;doi:10.1249/01.MSS.0000078924.61453.FB

37. Loprinzi PD, Lee H, Cardinal BJ: Evidence to support including lifestyle light-intensity recommendations in physical activity guidelines for older adults. AM J Health Promot 2015; 29:277–284

38. Chau JY, Grunseit A, Chey T, et al: Daily sitting time and all-cause mortality: a meta-analysis. PLoS One 2013; 8:e80000

39. Buman MP, Hekler EB, Haskell WL, et al: Objective light intensity physical activity associations with rated health in older adults. Am J Epid 2010; 172:1155–1165;doi:10.1093/aje/kwq249

40. Wasserstein RL, Lazar NA: The ASA's statement on p-values: context, process, and purpose. Am Stat 2016; 70:129–133; doi:10.1080/00031305.2016.1154108

41. Cohen J: *Statistical Power Analysis for the Behavioral Sciences*. 2nd ed. Hillsdale: Lawrence Erlbaum, 1988

42. McGowan JA, Brown J, Lampe FC, et al: Resilience and physical and mental well-being in adults with and without HIV. AIDS Behav 2018; 22:1688–1698;doi:10.1007/s10461-017-1980-6

43. Hu T, Zhang D, Wang J: A meta-analysis of the trait resilience and mental health. Pers Individ Differ 2015; 76:18–27;doi:10.1016/j.paid.2014.11.039

44. Lau SYZ, Guerra RO, Barbosa JFdS, et al: Impact of resilience on health in older adults: a crosssectional analysis from the International Mobility in Aging Study (IMIAS). BMJ Open 2018; 8: e023779;doi:10.1136/bmjopen-2018-023779

45. Childs E, de Wit H: Regular exercise is associated with emotional resilience to acute stress in healthy adults. Front Physiol 2014; 5:161;doi:10.3389/fphys.2014.00161

46. McEwen BS: Physiology and neurobiology of stress and adaptation: central role of the brain. Physiol. Rev 2007; 87:873–904; doi:10.1152/physrev.00041.2006

47. Brown JC, Huedo-Medina TB, Pescatello LS, et al: The efficacy of exercise in reducing depressive symptoms among cancer survivors: a meta-analysis. PLoS One 2012; 7:1–9

48. Callaghan P: Exercise: a neglected intervention in mental health care? J Psychiatr Ment Health Nurs 2004; 11:476–483

49. van Winkel M, Nicolson NA, Wichers, et al: Daily life stress reactivity in remitted versus non-remitted depressed individuals. Eur Psychiat 2015; 30:441–447;doi:10.1016/j.eurpsy.2015.02.011