


Predictors of Lower Depression Levels in Older Adults During COVID-19 Lockdown

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Abstract

Background: Social distancing during the COVID-19 pandemic may lead to adverse mental health consequences, such as depression, among older adults. This study aimed to investigate the predictors of lower depression scores in older adults living under lockdown. **Methods:** 1,123 older Brazilian adults were cross-sectionally assessed for depression, physical activity (PA), pet ownership (dogs, cats, and birds), ability to make video calls, leaving home during lockdown, and not living alone. The statistical procedures included linear regression and analysis of covariance (ANCOVA). **Results:** After adjusting for age, sex, and race, moderate to vigorous PA ($\beta = -0.014, p < .001$), it was found that PA ($\beta = -0.905, p < .001$) and dog ownership ($\beta = -0.545, p = .004$) were associated with lower depression. No association was observed between depression and other conditions. **Conclusions:** With the likelihood of subsequent COVID-19 waves, remotely delivered PA programs might be a strategy to counteract the negative psychological effects of lockdown on older adults.

Keywords

confinement, mental disorders, pandemic, physical activity

To prevent the spread of COVID-19 and to avoid a health system collapse (Losada-Baltar et al., 2020), in March 2020 many countries imposed social distancing measures such as lockdowns, leading to social disconnectedness (Anderson et al., 2020). A recent study on older adults suggested that social disconnectedness, arising from social isolation, loneliness, and a perceived lack of social support, predicts higher levels of depression (Santini et al., 2020). Depression is highly prevalent among older adults (Byers et al., 2010), and it is associated with poor health outcomes, such as risk of morbidity, self-neglect, and suicide, as well as decreased physical, cognitive, and social functioning, all of which are related to higher mortality (Blazer, 2003).

Recent observational studies, conducted 1 month after the March lockdown, including French, Italian, and Spanish participants estimated that about half of the individuals aged above 50 years presented depressive symptomatology (Arpino et al., 2020). In addition, a Chinese nationwide population study with 50,000 participants reported that higher psychological distress was more frequent among individuals over 60 years of age (Qiu et al., 2020). Indeed, older populations are more affected by and vulnerable to COVID-19 infections, and this population is most likely to require self-isolation during subsequent waves, until group immunity is achieved through vaccination.

Considering the possibility of new COVID-19 waves threatening the world, it is important to understand which factors are associated with lower depression levels in older adults. For instance, evidence shows an inverse relationship between physical activity and depressive symptoms in older adults (Zhang et al., 2021). However, the COVID-19 outbreak disrupted community exercise programs offered to older populations, impairing both physical activity and social contacts among attendees. For socially isolated older adults, video calls could help sustain social interactions

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with friends and family members, helping to reduce loneliness and depression (Gorenko et al., 2021). Similarly, pets might help reduce depression symptoms because they provide company and the perception of social support (McNicholas et al., 2005; Sharpley et al., 2020), which potentially contributes to mitigating loneliness and depressive symptomatology during home confinement. Based on the reviewed literature, we aim to observe if the abovementioned associations prevail during unusually isolating and stressful situations like lockdowns. It is also plausible to speculate that other factors such as not living alone, meaning the presence of cohabitants, and leaving home during the lockdown, could also contribute to diminishing depressive symptomatology.

The selective optimization with compensation (SOC) theory says that successful aging consists of doing the best one can do to adapt and deal with age-related gains and losses (Carpentieri et al., 2017). Accordingly, knowing the factors that can reduce depression during COVID-19 lockdown in older adults can help build interventions to help older adults compensate and adapt to the extreme stress of lockdowns, thus minimizing depressive symptomatology. Therefore, this study aimed to investigate the associations between physical activity, sitting time, pet ownership, not living alone, ability to make video calls, and leaving home during lockdown with depression scores in a community-based cohort study of older Brazilian adults. We hypothesized that physical activity, ability to make video calls, pet ownership, having cohabitants, and leaving home during confinement can predict lower depression scores.

Methods

Study Design

This is a cross-sectional observational study based in a non-probabilistic sample of 1,123 older Brazilian adults (60 years of age and older) enrolled in the community-based program “Fortaleza Cidade Amiga do Idoso,” hosted by Núcleo de Produções Culturais e Esportivas (NUPROCE), a nongovernmental organization from Fortaleza, Ceará, Brazil.

Participants and Procedures

“Fortaleza Cidade Amiga do Idoso” is a community-based program offering cultural, technological, leisure, and social support activities for adults and older adults from socioeconomically deprived neighborhoods from the Fortaleza urban area. For this study, the inclusion criteria were older adults aged ≥ 60 years enrolled in a community-based program in 2019 to 2020.

Data Collection

During 2019–2020, 1,453 older adults were enrolled in the community-based program in different in-person activities

(i.e., cultural activities, sports, and community gardening) according to their personal preferences. They were free to engage in these activities as many times in a week as they liked. However, all activities were suspended when the COVID-19 lockdowns began.

The participants' contacts were provided by the NUPROCE secretariat after the study's approval by the ethics board. All older adults registered for the community-based program were contacted via phone. For each participant, a maximum of six telephone call attempts were performed on different days and hours.

The lockdown in Fortaleza officially started on March 19. The first opening phase started on June 1 allowing some businesses to reopen. The fourth opening phase started on July 12, allowing some social activities. Data were collected during June 2020 (1–31) via phone calls. At the point of data collection, older adults were required to stay at home, while adults and children were allowed to leave home under certain specific circumstances.

Twenty interviewers, who used to undertake in-person program activities with older adults prior to confinement, were trained by three researchers to conduct the interviews. Data were gathered via telephone interviews, and answers were entered into a Google Forms database. As soon as the interviewers finished recording the respondent answers into the data set, the three researchers checked for missing data or typing errors.

Prior to the interview, informed consent was obtained from all respondents, and only those who provided verbal consent to participate were interviewed. The interview took an average of 30 minutes, and participants could withdraw from the survey at any time without justification.

The survey was approved by NUPROCE and the Secretaria de Direitos Humanos e Desenvolvimento Social of Fortaleza, Ceará, Brazil. All procedures were performed in accordance with the Declaration of Helsinki.

Measurements

Socio-demographic and health-related conditions. Socio-demographic data (sex, age, years of education, and race); lockdown duration; number of cohabitants; pet ownership (dogs, cats, and birds); weekly frequency of community-based program activities prior to the lockdown; and marital status were assessed using open-ended questions.

The presence of health conditions such as hypertension, dyslipidemia, diabetes, osteoarthritis, cardiovascular disease, and chronic respiratory disease, as well as tobacco use were assessed with “yes” or “no” answers. Similarly, the ability to make video calls and whether they went out of their homes during the lockdown were assessed with “yes” or “no” questions.

Anthropometry. Body weight (kg) and height (meters) were self-reported, and body mass index (BMI) was calculated as body weight divided by squared height (kg/m^2).

Physical activity. Physical activity was measured using the Brazilian validated short version of the International Physical Activity Questionnaire (IPAQ-SV) (Craig et al., 2003). The IPAQ-SV assesses the frequency and duration of moderate to vigorous physical activity, walking, and time spent sitting in the previous week. Physical activity was labeled as “low,” “moderate,” and “high” according to the IPAQ-SV scoring protocol (accessible at <http://www.ipaq.ki.se/>). In addition, participants were classified based on the WHO 2020 guidelines on physical activity and sedentary behavior (performing ≥ 150 minutes per week of moderate to vigorous physical activity) (Bull et al., 2020).

Depression score. Depression was determined using the Brazilian validated Geriatric Depression Scale–Short Form (GDS-15) (Almeida & Almeida, 1999). The GDS-15 comprises 15 questions assessing older adults’ moods in the last week. Possible scores range from 0 to 15, with higher scores reflecting a worse depressive state. Continuous scores were coded into dichotomous categories. A score of 5 or more was considered suggestive of the presence of depression (Almeida & Almeida, 1999), which indicates that depression should be confirmed and evaluated by a trained clinician. The validated Brazilian version presents a reliability coefficient of 0.81 (Almeida & Almeida, 1999).

Statistical procedures. Descriptive statistics and frequency analysis were used to describe the participants’ characteristics. Between-group comparisons were performed using independent *t*-test and analysis of covariance (ANCOVA), adjusting for sex, age, and race, with Bonferroni post hoc tests (for comparisons between low, moderate, and high activity levels groups). The magnitude of the differences was observed with the effect size checked as η^2 (0.02, 0.12, and 0.26 as small, moderate, and large, respectively) (Cohen et al., 2003).

Multivariate linear regression analysis with the enter method was used to explore the association between depression scores and independent predictors. We conducted several different models, always adjusting for age, sex, and race. The final models were as follows. In Model 1, each independent variable (moderate to vigorous physical activity [continuous variable], performing physical activity as per guidelines [dichotomous variable], sitting time, dog ownership, cat ownership, bird ownership, ability to make video calls, not living alone, and leaving home during confinement) was entered one at a time and adjusted for age, sex, and race. In Model 2, the variables of guideline-based physical activity (dichotomous variable), sitting time, dog ownership, cat ownership, bird ownership, ability to make video calls, not living alone, and leaving home during confinement were entered simultaneously into the model, and adjusted for age, sex, and race. In Model 3, the variables of moderate to vigorous physical activity (continuous variable), sitting time, dog ownership, cat ownership, bird ownership, ability to

make video calls, not living alone, and leaving home during confinement were entered together in the model and adjusted for age, gender, and race.

P values $< .05$ were considered significant.

Results

Of the 1,453 participants enrolled in the program, 107 older adults had invalid telephone numbers, 197 did not answer phone calls, 11 declined to participate, and 1,123 agreed to answer the survey. Participants (67.68 ± 5.91 years old; 90.7% women) self-reported a lockdown lasting 11.59 ± 2.42 weeks. Prior to home confinement, older adults used to attend 2.14 ± 0.51 community-based program activities per week. In addition, 89.3% of the sample was not living alone, and the average number of cohabitants was 1.92 ± 1.37 persons (Table 1). During lockdown, participants spent an average of 18 minutes per day in moderate to vigorous physical activity, and 20% performed the recommended level of physical activity. About one in three participants owned a dog, and approximately half of the participants were able to make video calls. The mean value on the GDS-15 was 3.57, and 30.4% of the participants had depressive symptoms.

Table 2 displays between-group depression scores comparisons according to achievement of physical activity recommendation, physical activity level (low, moderate, or high intensity), pet ownership, not living alone, leaving home during lockdown and ability to make video calls during the confinement. The group of older adults who achieved physical activity recommendations had a lower depression score compared to older adults who did not achieve the recommendations (2.79 ± 2.22 score vs. 3.77 ± 2.94 score, respectively, $p < .001$). Similarly, the low physical activity intensity group (4.09 ± 3.12 score) had a higher depression score compared to the moderate (2.83 ± 2.23 score, $p = .003$) and high (2.96 ± 2.14 score, $p < .001$) physical activity intensity groups; however, between the two higher physical activity intensity groups (moderate vs. high-level groups), depression levels were not different ($p > .05$). Comparison in depression score according to dog ownership was also significantly different (own a dog: 3.30 ± 2.50 score vs. non-dog owners: 3.70 ± 2.98 score, $p = .017$) (Table 2). Sensitivity analyses considering only females generated similar results (Table 2).

Figure 1 shows between-group comparisons of depression scores after adjusting for age, sex, and race. Older adults who owned a dog had a significantly lower depression score compared to those who did not own a dog (mean difference: -0.408 ± 0.181 ; $p = .024$; $\eta^2: 0.005$). Similarly, older adults who achieved physical activity recommendations compared to those who did not have a significantly lower depression score (mean difference: -0.968 ± 0.207 ; $p < .001$; $\eta^2: 0.019$). In addition, between-group comparisons according to physical activity intensity showed that those engaged in low-intensity physical activity had significantly higher depression scores than those with moderate (mean

Table 1. Characteristics of 1,123 Older Brazilians.

Characteristic	
Age, years	67.68 ± 5.91
Gender—female (%)	90.7
Race—white (%)	34.8
Education (%)	
<6 years	38.6
6–12 years	54.3
>12 years	7.1
Not living alone (%)	89.3
Cohabitants, n	1.92 ± 1.73
Weekly attendance in program activities prior to confinement, n/week	2.14 ± 0.51
Retirement (%)	73.5
Smokers (%)	1.8
Body mass index, kg/m ²	27.08 ± 4.00
Hypertension (%)	62.2
Dyslipidemia (%)	44.9
Diabetes mellitus (%)	29.5
Cardiovascular disease (%)	9.8
Chronic respiratory disease (%)	12.9
Osteoarthritis (%)	47.6
Physical activity	
Moderate to vigorous physical activity, minute/day	18.70 ± 29.76
Sitting time, minute/day	325.51 ± 144.40
Fulfilling physical activity recommendations (%)	20.8
Physical activity level (%)	
Low physical activity	57.3
Moderate physical activity	35.7
High physical activity	6.4
Dog ownership (%)	32.3
Cat ownership (%)	22.5
Bird ownership (%)	15
Ability to make video calls (%)	49.6
Leaving home during confinement, yes (%)	56.3
Mean depression, score	3.57 ± 2.83
Depression (%)	30.4

Note. Values are $M \pm SD$ (continuous variables) or percentage (categorical variables).

difference: 1.246 ± 0.177 ; $p < .001$; $\eta^2: 0.046$) and high physical activity intensities (mean difference: 1.065 ± 0.345 ; $p < .01$; $\eta^2: 0.046$). The mean difference in depression scores between the moderate and high physical activity groups was not significant (mean difference: 0.181 ± 0.355 ; $p = .609$). Finally, the mean difference in depression score according to leaving home during the lockdown (mean difference: -0.270 ± 0.186 ; $p = .146$; $\eta^2: 0.002$), ability or inability to make video calls (mean difference: -0.024 ± 0.178 ; $p = .892$; $\eta^2: 0.000$), having or not having a cat (mean difference: 0.255 ± 0.203 ; $p = .209$; $\eta^2: 0.001$), having or not a bird (mean difference: 0.060 ± 0.236 ; $p = .800$; $\eta^2: 0.000$), and living alone (mean difference: 0.014 ± 0.274 ; $p = .960$; $\eta^2: 0.000$) were not significantly different (Figure 1).

The linear regression analysis is presented in Table 3. Moderate to vigorous physical activity ($\beta = -0.014$, $p <$

$.001$), achieving physical activity recommendations ($\beta = -0.905$, $p < .001$), and dog ownership ($\beta = -0.545$, $p = .004$) predicted lower depression scores. In contrast, sitting time, being able to make video calls, leaving home during confinement, cat or bird ownership, and not living alone were not associated with the outcome. All models generated similar results.

Discussion

This study attempted to identify factors that possibly reduce the level of depression in older adults during the COVID-19 pandemic lockdown in Brazil. Our findings suggest that performing the recommended level of physical activity and having a pet dog lead to lower depression scores, while the ability to make video calls, not living

Table 2. Group Comparisons in Depression Score During the Lockdown (According to Physical Activity, Dog Ownership, Not Living Alone, Ability to Make Video Calls, and Leaving Home During Lockdown).

	Depression scores	
	Overall (females + males) (N = 1,123)	Females (N = 1,019)
Performing recommended amount of physical activity		
Yes	2.79 ± 2.22	2.84 ± 2.27
No	3.77 ± 2.94	3.79 ± 2.98
Statistical inference	$t = 5.614$ (gl: 473.102); $p < .001$	$t = 5.132$ (gl: 427.062); $p < .001$
Physical activity intensity		
Low	4.09 ± 3.12 ^a	4.13 ± 3.15 ^b
Moderate	2.83 ± 2.23	2.82 ± 2.24
High	2.96 ± 2.14	3.10 ± 2.21
Statistical inference	$F = 27.350$ (gl:2); $p < .001$	$F = 25.424$ (gl:2); $p < .001$
Dog ownership		
No	3.70 ± 2.98	3.75 ± 3.01
Yes	3.30 ± 2.50	3.28 ± 2.50
Statistical inference	$t = 2.348$ (gl: 836.702); $p = .019$	$t = 2.625$ (gl: 756.101); $p = .009$
Cat ownership		
No	3.51 ± 2.84	3.54 ± 2.88
Yes	3.77 ± 2.82	3.79 ± 2.82
Statistical inference	$t = -1.328$ (gl: 1.121); $p = .186$	$t = -1.180$ (gl: 1.017); $p = .238$
Bird ownership		
No	3.56 ± 2.84	3.59 ± 2.88
Yes	3.61 ± 2.80	3.64 ± 2.80
Statistical inference	$t = -0.252$ (gl: 1.121); $p = .801$	$t = -0.212$ (gl: 1.017); $p = .832$
Not living alone		
Yes	3.60 ± 2.81	3.59 ± 2.82
Not	3.56 ± 2.84	3.60 ± 2.87
Statistical inference	$t = 0.134$ (gl: 1.121); $p = .893$	$t = -0.035$ (gl: 1.017); $p = .972$
Ability to make video calls		
No	3.58 ± 2.93	3.62 ± 2.99
Yes	3.56 ± 2.73	3.57 ± 2.73
Statistical inference	$t = 0.104$ (gl: 1.121); $p = .917$	$t = 0.260$ (gl: 1.017); $p = .795$
Leaving home during lockdown		
No	3.65 ± 2.83	3.66 ± 2.86
Yes	3.46 ± 2.82	3.49 ± 2.85
Statistical inference	$t = 1.058$ (gl: 1.033); $p = .290$	$t = 0.861$ (gl: 0.945); $p = .389$

^{a,b}Bonferroni post hoc tests: Low versus Moderate physical activity and low versus high physical activity are significantly different.

alone, leaving home during confinement, and owning a cat or bird do not.

In our sample, the prevalence of depression was 30.4%, which is quite similar to the prevalence observed in an epidemiological study carried out with 1,556 older Chinese adults during the COVID-19 wave (Meng et al., 2020). Depression is possibly the most common cause of emotional distress later in life (Blazer, 2003). The COVID-19 pandemic has intensified many stressors such as fear of death, death of friends and family members, isolation, financial problems, lack of support, and others (Shader, 2020), which together might increase the susceptibility to depression. Others have already argued that older adults might be especially vulnerable to the psychological consequences of the COVID-19

outbreak because they are a major risk group for disease severity and mortality (Losada-Baltar et al., 2020). Indeed, depression and loneliness, resulting from social isolation, act in a synergistic way in older adults (Domenech-Abella et al., 2020), and the COVID-19 pandemic brought together many sources of stress and social isolation, with experts affirming that “the negative impact of the COVID-19 crisis on geriatric mental health is unquestionable” (Forlenza et al., 2020). However, it is worth mentioning that some studies conducted in the United States, Canada, Spain, and the Netherlands found that in terms of the pandemic’s effect on mental health, older adults may be less negatively affected than other age groups, suggesting that they have higher resilience to anxiety and depression than younger people (Vahia et al., 2020).

Table 3. Multivariate Relationship Between Depression Score and Independent Variables.

	β	p value
Model 1		
Moderate to vigorous physical activity, min per day	-.015	<.001
Achieving physical activity recommendations, no/yes ^a	-.968	<.001
Sitting time, minutes per day	.000	.480
Dog ownership, no/yes ^a	-.408	.024
Cat ownership, no/yes ^a	.255	.209
Bird ownership, no/yes ^a	.060	.800
Ability to make video calls, no/yes ^a	.067	.715
Leaving home during confinement, no/yes ^a	-.270	.146
Not living alone, yes/no ^b	.014	.960
Model 2		
Fulfilling physical activity recommendations, no/yes ^a	-.905	<.001
Sitting time, min per day	.000	.982
Dog ownership, no/yes ^a	-.517	.007
Cat ownership, no/yes ^a	.334	.111
Bird ownership, no/yes ^a	.114	.642
Ability to make video calls, no/yes ^a	.113	.541
Leaving home during confinement, no/yes ^a	-.286	.124
Not living alone, yes/no ^b	-.218	.455
Model 3		
Moderate to vigorous physical activity, min per day	-.014	<.001
Sitting time, min per day	.000	.815
Dog ownership, no/yes ^a	-.545	.004
Cat ownership, no/yes ^a	.357	.087
Bird ownership, no/yes ^a	.129	.599
Ability to make video calls, no/yes ^a	.105	.571
Leaving home during confinement, no/yes ^a	-.215	.459
Not living alone, yes / no ^b	-.225	.439

Note. In Model 1, the independent predictors (moderate to vigorous physical activity OR fulfilling physical activity recommendations OR sitting time OR dog ownership OR cat ownership OR bird ownership OR ability to make video calls OR leaving home during confinement OR not living alone) were individually entered into the model (one at a time) adjusted for age, gender, and race.

In Model 2, the independent predictors (fulfilling physical activity recommendations, sitting time, dog ownership, cat ownership, bird ownership, ability to make video calls, leaving home during confinement and not living alone) were simultaneously entered into the model and adjusted for age, gender, and race.

In Model 3, the independent predictors (moderate to vigorous physical activity, sitting time, a dog ownership, cat ownership, bird ownership, ability to make video calls, leaving home during confinement and not living alone) were entered together and adjusted for age, gender, and race.

^aBinary variables (no = 0 [reference]; yes = 1).

^bBinary variables (yes = 0 [reference]; no = 1).

Concerning physical activity, our results showed that getting adequate exercise is associated with lower depression levels, which is in line with the recently published recommendations of the WHO for physical activity in older adults (Bull et al., 2020). In this study, participants were also categorized as having low, moderate, and high physical activity levels, and we observed that the depression score was lower in both moderate and high groups than in the low physical activity group. The WHO guidelines on physical activity recommend that

older adults should do at least 150–300 min of moderate-intensity aerobic physical activity, or at least 75–150 min of

vigorous-intensity aerobic physical activity, or an equivalent combination of moderate-intensity and vigorous-intensity activity throughout the week for substantial health benefits,

and our results corroborate the WHO physical activity recommendations, affording empiric evidence that moderate and high physical activity might impact depressive score and then improve older adult's mental health (Bull et al., 2020). Moreover, we observed an association between moderate to vigorous physical activity as a continuous variable, and results showed an inverse association with depression score. This finding echoes Callow et al., who showed similar results in 1,046 North American adults aged 50 years or more living under the COVID-19 social distancing lockdowns (Callow et al., 2020). Even before this health crisis, many studies had found that physical activity later in life is associated with lower depression levels (Ku et al., 2009, 2012; Overdorf et al., 2016; Salguero et al., 2011). Our findings build upon and expand these previous results by evaluating older adults in an unusual and psychologically challenging period, that is, the COVID-19 lockdown. Mechanisms for these benefits include social interaction during exercise and a sense of enjoyment and fulfillment during physical activity, as well as increased central norepinephrine neurotransmission, changes in the hypothalamic adrenocortical system, increased secretion of atrial natriuretic peptide, serotonin synthesis and metabolism, and beta-endorphins (Strohle, 2009).

In this study, we observed lower depression scores in participants who had a pet dog. However, this effect was absent in those who owned cats or birds. Dogs are known to provide a certain amount of social support and reduce loneliness by giving company (McNicholas et al., 2005) to the owner. Playing with the dog, taking it out for a walk, or simply touching or cuddling it (Oliva & Johnston, 2021) provides psychological benefit. At this stage, to the best of our knowledge, there is only one study, conducted in Australia, which also found that dog ownership protected against loneliness, but cat ownership did not (Oliva & Johnston, 2021). The authors argued that cats had a less predictable reaction to their owners being at home and cats were a source of worry for their owners, which might have contributed to the fact that no benefit was observed in terms of reducing loneliness. On the contrary, dogs encouraged owners to take them for a walk, giving them opportunities to socialize (Oliva & Johnston, 2021). However, Needell et al. suggested that there is not enough evidence to support the statement in popular culture that pet possession is beneficial in conserving the mental health of older adults (Needell & Mehta-Naik, 2016). Based on our findings, we speculate that dog ownership might be associated with lower depression scores because it helps reduce the perception of loneliness and social isolation, especially during a period of forced isolation. Moreover, it is possible that dog ownership indirectly affects depression because caring for a dog entails going for outdoor walks and engaging in some kind of play activity. Indeed, it

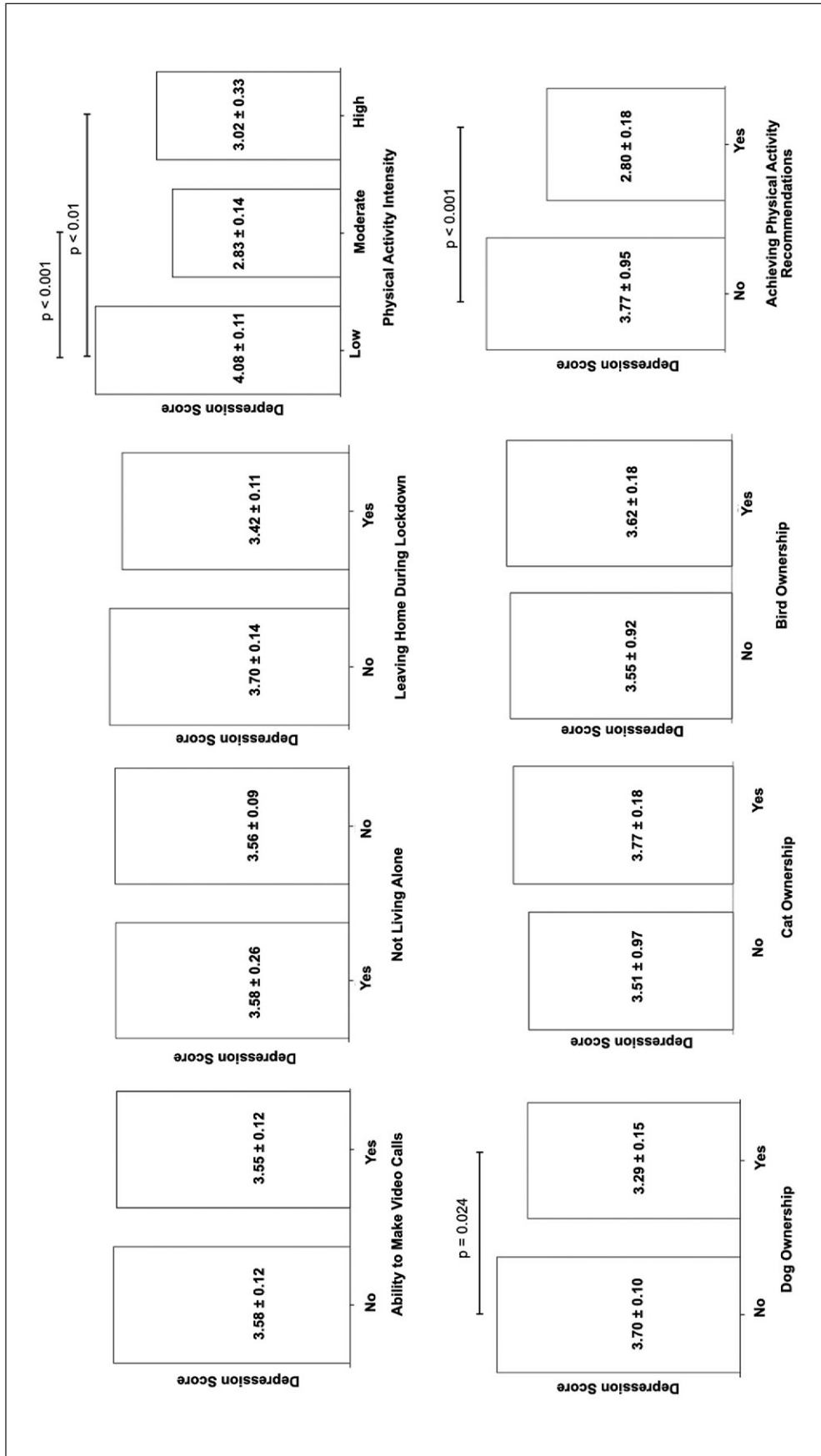


Figure 1. Mean ± standard error and between-groups comparisons (Bonferroni post hoc tests).
 Note: Analyses adjusted for age, sex, and race.

was previously reported that dog owners have significantly higher physical activity levels compared to non-dog owners (Mickova et al., 2019). More research in this field is needed, and the results must be interpreted with caution. Finally, to the best of our knowledge, no study has explored the association between bird ownership and depression.

The ability to make video calls, leaving home during confinement, and not living alone did not significantly affect the depression score. It was expected that during a period of decreased social interaction due to social isolation, the ability to make video calls would be associated with lower levels of depression. Phone and video calls are strategies to sustain social interactions with friends and family members, reducing loneliness and depression (Gorenko et al., 2021), but our results did not confirm this hypothesis. Studies concerning the use of video calls and depression levels in older adults have yielded inconsistent results. Teo et al. suggested that the use of video chats could lower depression risk among older adults (Teo et al., 2019). Tsai et al. showed that video calls lasting 5 minutes once a week between older adults' (residents in nursing homes) and family members significantly reduced depression after a 3-month intervention (Tsai et al., 2010). In contrast, another study found no evidence that cell-phones would protect against depressive symptoms in older adults (Elliot et al., 2014). In line with this, we also expected that older adults who lived alone would have higher depression symptoms, but our hypothesis, which was based on studies reporting that older adults who live alone are more likely to report depressive symptoms than those who live with a spouse or other family member (Stahl et al., 2017) was not confirmed.

This study may have some limitations. One major limitation is the cross-sectional design, which prevents us from making causal inferences. It was not possible to perform cognitive or decision-making capacity assessments during the interviews. Results were predominantly obtained from older women and might not be generalizable to older men. Since physical activity was self-reported, the data could be affected by the common tendency to overestimate moderate to vigorous physical activity and underestimate sitting time (Grimm et al., 2012). In addition, we did not collect information on the weekly frequency or duration of video calls. Finally, there are no data about participants' lifestyle before lockdown as the lockdowns were sudden and unexpected.

Conclusions

In summary, strategies to minimize potential depressive states in older adults are needed to protect the mental health of this vulnerable group, as it is clear at this stage that continued self-isolation will be required for an indefinite period as new COVID-19 waves arrive. Our results confirm and add to previous findings by suggesting that physical activity and dog ownership may contribute to mitigating the risk of depression during lockdown in older adults. Future studies

should analyze the long-term impact of social distancing measures on older adults' lifestyles and mental health. In addition, the effectiveness of remotely delivered interventions designed to improve mental health, such as online physical activity classes, must be ascertained. Also, the long-term impact of dog ownership on the mental health of older adults must be studied. This will help policymakers implement well-designed strategies and apply our findings in the light of the SOC theory to help older adults who are under social distancing measures better counteract psychological distress if future lockdowns are needed.

Declaration of Conflicting Interests

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Institutional Review Board (IRB)

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