# Risk Factors for Potential Mental Illness Among Brazilians in Quarantine Due To COVID-19

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## Abstract

**Background:** During quarantine, both physical and mental health are a concern. To the same extent that physicians are a scarce resource during this crisis, psychiatrists and psychologists are also limited in number. To help practitioners and public managers decide where to invest their resources, the present research investigated the relationships of stress, depression and state anxiety levels with sociodemographic and behavioural variables.

**Methods:** Data were collected in Brazil between March, 18 and 22, 2020 in 1,468 volunteers during quarantine. Participants with a history of or current mental health illnesses were excluded leaving 1,460 individuals in the final sample. The online assessment included instruments for psychological stress, depression and state anxiety. A sociodemographic and behavioural questionnaire with 15 items was used to assess other factors. Multiple linear regression was performed for each psychological outcome to determine a hierarchy of significant predictors.

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**Findings:** Stress, depression and state anxiety levels were all predicted by gender (women higher than men), quality of nutrition, attendance in tele-psychotherapy, exercise frequency, presence of elderly persons in quarantine with the person, obligation to work outside the home, level of education (more educated, lesser risk for mental illness) and age (younger age, greater risk). Having a perceived risk factor for COVID-19 predicted depression and state anxiety, but not stress. Finally, the presence of children in quarantine with the participant was a protective factor for depression.

**Interpretation:** Even though this research is limited by its cross-sectional design, it is possible to infer that mental health varies by demographic attributes, obligations and health behaviours. Those who report higher distress must work outside the home during quarantine, live with an elderly person and carry a risk factor for COVID-19, among other factors. Identifying those who are most vulnerable would help to prioritize those who may need the greatest psychological aid and assist public health practitioners in developing support strategies.

## Introduction

Mental health can be defined as an internal state of well-being, psychological balance and cognitive and coping abilities used in harmony with the universal values of society, which allows individuals to work, cope and solve problems in everyday tasks (Galderisi et al., 2015; World Health Organization [WHO], 2004). According to the WHO, 14% of the global burden of disease can be attributed to mental health disorders (Prince et al., 2007; WHO, 2008). Consequently, the WHO developed the Mental Health Gap Action Programme (mhGAP), which is a project that aims to raise awareness about the deficit between physical and mental health. Moreover, the programme aims to provide evidence-based practices and guidelines to help mental health practitioners in their everyday work (WHO, 2008). Of particular emphasis in this report is the urgent need to "scale up" mental health interventions, which requires acute knowledge of situational factors, population needs and identifying those most at risk.

Due to the outbreak of the Corona Virus Disease 2019 (COVID-19), quarantine was adopted as a strategy to avoid its spread in several countries in the first quarter of 2020 (WHO, 2020; Wilder-Smith & Freedman, 2020). Although it became clear that public policies to prohibit people from going outside their homes were necessary (WHO, 2020), physicians, nurses, physical therapists and

other critical healthcare providers remained working to protect the physical health of COVID-19 (SARS-CoV-2) and other patients (Rubin & Wessely, 2020). However, other essential members of the workforce, such as supermarket employees, public servants and police, were also on the streets to maintain a functioning society, exposing them to a greater risk of contracting COVID-19 than those in quarantine (Rubin & Wessely, 2020; Webster et al., 2020; WHO, 2020; Wilder-Smith & Freedman, 2020).

Social isolation poses an additional big challenge to workers both inside and outside of the home (Brooks et al., 2020; Qiu et al., 2020; Rubin & Wessely, 2020; Webster et al., 2020; Xiao, 2020). Some research has been conducted in quarantined samples (Xiao, 2020); however, the current condition is one of the few times when a large amount of the global population has been confined to their own homes. Therefore, those in quarantine are facing stressful living conditions without any previous training and little time for preparation (Rubin & Wessely, 2020). For example, in 2016, Jeong et al. investigated anxiety and anger in participants confined for two weeks due to Middle East Respiratory Syndrome (MERS). They found that both psychological variables were higher during confinement. Anxiety measured during confinement had a prevalence of 7.6% versus 3.0% out of isolation; whereas, anger was reported among 16.6% of confined participants decreasing to 6.4% six months after the end of isolation (Jeong et al., 2016). This is the only Longitudinal quantitative study of psychological symptoms in participants obliged to maintain social isolation thus far in the literature (Brooks et al., 2020). However, similar studies with cross-sectional sampling have been conducted to assess different psychological conditions and states among participants in quarantine. Hawryluck et al. (2004) collected post-traumatic stress and depression symptom data from 129 participants supposedly exposed to SARS and prohibited to leave quarantine for an average of ten days. These individuals had a greater number of symptoms compared to normative data. Other papers have presented similar results for: stress (Hawryluck et al., 2004; Jeong et al., 2016; Reynolds et al., 2008; Taylor et al., 2008; Wang et al., 2011; Wu et al., 2009), depression (Jeong et al., 2016; Wu et al., 2009), anxiety (Hawryluck et al., 2004; Jeong et al., 2016) and hopelessness (Wu et al., 2009). Although the present study does not compare its results to normative data due to the lack of norms in some of the measures, it is important to highlight the need to understand the role of behavioural and psychosocial factors to predict mental health in people going through confinement and social isolation.

Even though people in quarantined conditions seem to have higher levels of stress, anxiety and depression-like symptoms (Brooks et al., 2020), mental health practitioners and programs are not a limitless resource. In fact, the current availability of resources may be only a small fraction of what is needed at the peak of a crisis. Empirical evidence suggests that some individuals who show mental health issues during an epidemic crisis will needhelp for months or even years after the appearance of their first symptoms (Jeong et al., 2016; Xiao,

2020). Consequently, public policies and strategies should be adopted to appropriately and expediently match psychology and psychiatry professionals with those most vulnerable. In consideration of the possible strategies for public managers to address the growing mental health problem, it seems reasonable to identify individuals in the community whose characteristics match the risk profile for becoming mentally ill during pandemic quarantine, to provide screening and consider for appropriate referral and treatment.

Regarding mental health, or more specifically distress, anxiety and depression, some demographics (e.g., gender (Almeida & Kessler, 1998; Barros et al., 2017; McLean & Anderson, 2009; Nolen-Hoeksema, 2001), age (Christensen et al., 1999), education, number of people in confinement with the person (Qiu et al., 2020), other variables (Taylor et al., 2008; Timmer et al., 2011)) and behavioural (balanced nutrition (Lim et al., 2016), regular exercise (Paluska & Schwenk, 2000; Stults-Kolehmainen & Sinha, 2014), psychotherapy (Lambert et al., 1994), and telepsychology (Bolton & Dorstyn, 2015; Varker et al., 2019)) outcomes seem to be associated with or directly reduce or increase its levels. However, most of this evidence was gathered with people who were not in confinement at home. Therefore, the current study aims to identify risk factors predictive of perceived stress, anxiety and depression among people in quarantine.

## Method

### Participants

Participants of the present study were 1,468 volunteers in different levels of government-mandated confinement at home. Inclusion criteria were being an adult (two volunteers were not included due to this criterion), a speaker of Brazilian Portuguese, and in quarantine or living with another person in quarantine for at least 3 days due to COVID-19 outbreak. Eligible participants signed a consent form (two individuals refused and were not included). The exclusion criteria were being under psychiatric treatment or having any history of previous treatment (four volunteers were excluded based on these criteria) which lead to the final number of 1,460 participants.

### Procedure

The present research was approved by the institutional Ethics Committee before data collection. All procedures followed Brazilian Legislation (i.e., Resolution #196/96 of the Brazilian National Health Council (National Council of Health, 1996)) and the Declaration of Helsinki. After approval, a website in Google Forms presented the following instruments in the same order for all participants: (i) Consent form, (ii) Perceived Stress Scale-10, (iii) Filgueiras

Depression Inventory, State and Trait Anxiety Inventory: state subscale, (iv) sociodemographic information. No answer could be left blank after the participant started; the entire form had to be completed in order to send it to the server. The method of snowball sampling was adopted for recruitment, which consequently lead to a convenience sample. Advertisements were placed on the first author's and his laboratory's social media accounts, and participants were encouraged to invite other potential candidates for the study. The inclusion criteria were volunteers with more than 18 years of age, who lived in Brazil during the data collection timeframe. The exclusion criteria were participants with previous history of untreated mental illnesses and foreigners who were in vacation in Brazil during the quarantine. Data collection happened between March 18th and March 22nd of 2020, from 3 to 7 days after the COVID-19 quarantine Lockdown declared by the Brazilian States Governors on National Television. The spreadsheet generated by the Google Drive was saved in Microsoft Excel format for further analysis.

## Instruments

Perceived Stress Scale-10 items version (PSS-10) (Cohen & Williamson, 1988): The PSS-10 is a 10-item scale with questions regarding the frequency stress perceptions in the last month. The participant answers to those questions on a 5-point Likert-type scale that ranges from "0-never" to "4-very often". Sample of questions are: "In the last month, how often have you been able to control irritations in your life?" and "In the last month, how often have you felt that you were unable to control the important things in your life?". Items 4, 5, 7 and 8 are reverse-scored before summing to generate the total score. The population mean is 17.0 (SD = 5.02) with a score over 27 indicating excessive stress (Cacciari et al., 2016).

Filgueiras Depression Inventory (FDI) (Filgueiras et al., 2014): The FDI is a 20-item inventory of words related to depression-like symptoms according to the DSM-V. The participant associates each one of these twenty words to her/his own feelings in the last fortnight. The Likert-type scale containsn six categories of endorsement ranging from "0-not related to me at all" to "5-totally related to me". Examples of the 20-item word list are: "Melancholy", "Sadness", "Disgust", "Displeasure" and "Death". The total score is simply the sum of all items. The reference mean is 53.3 (SD = 17.3) with 88 or higher indicating a cut-off for depressive symptomology (Filgueiras et al., 2014).

The Spielberg State and Trait Anxiety Inventory – State Subscale (SSTAI) (Spielberger et al., 1970): The SSTAI is one in a set of two subscales developed to assess two dimensions of anxiety: trait and state. The trait anxiety refers to personality characteristics of an individual that facilitates the occurrence of anxiety-like symptoms and behaviours. On the other hand, state anxiety comprises how one feels in the moment the inventory is completed. The state anxiety

subscale has a 20-item structure that is answered with a 4-category Likert scale. Specifically, the SSTAI responses range from "1-not at all" to "4-very much so". Examples of items are: "I feel calm", "I feel nervous" and "I am presently worrying over possible misfortunes". Items 1, 2, 5, 8, 10, 11, 15, 16, 19 and 20 are reverse-scored before summing all of the responses to provide the total score. Gender-specific reference means are 36.5 (SD = 21.4) for men and 43.7 (12.6) for women, with cut-offs being 66 for men and 69 for women (Pasquali et al., 1994).

Sociodemographic questionnaire: Due to potential social and demographic characteristics found in the literature linked to stress, anxiety and depression among diverse samples, including recent studies about COVID-19 (Brooks et al., 2020; Jeong et al., 2016; Qiu et al., 2020; Rubin & Wessely, 2020; Webster et al., 2020; Xiao, 2020). A simple "yes" or "no" dichotomous response was provided for the following questions: "Is an elderly person in quarantine with you?", "Are children in quarantine with you?" and "Do you have any risk factors for COVID-19?". A question about quarantine status at home was asked with two possible responses: either "Yes (I am not going outside)" or "No (I do go outside, even if rarely)". A 3-category response ("yes", "sometimes" and "no") was used for two questions: "Does your job require you to go outside?" and "Have you used telemedicine services yet?". Another three questions provided the participant a 3-category response options, although they were presented differently. The item called "Nutrition" offered the following options: "Balanced meals every time", "Balanced meals sometimes" and "Meals that are not balanced". The item called "Exercise" provided these possible responses: "At least 4 times a week", "Between 1 and 3 times a week" and "No exercise". The question "Do you attend psychotherapy (online)?" had these options for responding: "Regularly", "Only for emergencies" and "No psychotherapy at all". Gender was also collected with three possible categories: "man", "woman" and "other". Education had five response levels: "Elementary school", "High school", "Bachelor's degree", "Master's degree" and "Doctoral degree". Finally, there were four items of the sociodemographic questionnaire that required a numeric response: "Age", "Total number of members in the nuclear family" (not necessarily with the participant at home), "Number of family members in quarantine with you" and "Number of days in quarantine".

## Data analysis

Continuous demographic variables (i.e., age, total number of members in the nuclear family, number of family members in quarantine with you and number of days in quarantine) and total scores of psychometric measures were described in terms of average and S.D. Descriptive statistics (mean and standard deviation (S.D.)) for stress, anxiety and depression levels were also calculated for each level of the categorical variables.

Before proceeding to inferential statistics, normality was tested using Kolmogorov-Smirnov test for the three dependent variables: perceived stress, anxiety and depression. Due to the fact that normality was found in those three outcomes, null-hypothesis tests were performed to compare means of PSS-10, FDI and SSTAI for different categories in demographic variables. Specifically, for independent variables with two categories the *t*-test was used and effect-size was measured by Cohen's d; for independent variables with more than two categories, a one-way ANOVA was chosen to compare groups and Cohen's f was used for effect-size. Differences were significant considered when the *p*-value was below 0.05; whereas effect-size interpretation followed the cut-offs from Cohen (Cohen & Williamson, 1988). For Cohen's d, the values indicate a small effect-size when between 0.20 and 0.50; between 0.50 and 0.80 is interpreted as a moderate size, and above 0.80 depicts a large effect-size. For Cohen's f, the values are considered a small effect-size when between 0.10 and 0.25; between 0.25 and 0.40 is a moderate size, and above 0.40 entails a large effect-size.

Three multiple linear regressions were performed to identify which sociodemographic and behavioural variables independently predict stress, state anxiety and depression. The stepwise method was adopted to retain variables if they contributed significantly to predict the dependent variable (i.e., improve the statistical linearity of the function in comparison to the constant). Inclusion and exclusion of variables was based on the *t*-test *p*-values; whereas, the level of contribution of the sociodemographic or behavioural variables was assessed through Beta. Because most of variables used in the regression were categorical, a positive Beta does not necessarily mean a positive association and vice-versa; it applies only when variables were continuous. The coefficient of determination ($r^2$) was also calculated to reveal the amount of variance explained by the independent variables. Acceptable values of $r^2$ for social sciences and clinical studies with humans may vary between 0.20 and 0.40, although the closer to 1.0, the better (Hamilton et al., 2015). To understand the sample distribution, three dispersion graphs and their respective line of tendency were generated with the total score of PSS-10, FDI and SSTAI in the axis y and the results of the multiple linear function in the axis x.

## Results

Participants reported an average of 4.09 (S.D. = 0.97) days in quarantine. The sample's mean age was 32.9 (S.D. = 12.1), the number of members in the nuclear family was 3.9 (S.D. = 3.3) and the number of family members in quarantine with the person was 3.1 (S.D. = 1.7). PSS-10, FDI and SSTAI descriptive statistics stratified for each categorical independent variable, along with null-hypothesis tests, are presented in Table 1. Even though "other" was an option for gender, it was not analysed in this data collection because of a small number

**Table 1.** Descriptive statistics and null-hypothesis tests of stress, depression and state anxiety for all categorical variables.

| Groups (samples) | Psychological variable | | | | | | | | |
| | Stress (PSS-10) | | | Depression (FDI) | | | Anxiety (SSTAI) | | |
| | Average (S.D.) | p-value | effect-size | Average (S.D.) | p-value | effect-size | Average (S.D.) | p-value | effect-size |
|---|---|---|---|---|---|---|---|---|---|
| Whole sample (N = 1460) | 20.29 (8.51) | – | – | 51.57 (23.08) | – | – | 53.54 (12.93) | – | – |
| Education | | | | | | | | | |
| High School (N = 204) | 24.08 (8.31) | <0.01 | 0.25 | 60.12 (22.19) | <0.01 | 0.24 | 57.25 (11.84) | <0.01 | 0.16 |
| Bachelor (N = 1024) | 20.14 (8.40) | | | 51.80 (23.34) | | | 53.47 (13.07) | | |
| Master (N = 170) | 17.25 (8.32) | | | 43.75 (19.88) | | | 50.18 (12.62) | | |
| Doctorate (N = 62) | 17.65 (6.00) | | | 39.55 (17.20) | | | 50.42 (11.18) | | |
| Gender | | | | | | | | | |
| Women (N = 1064) | 20.96 (8.69) | <0.01 | 0.33 | 53.07 (23.47) | <0.01 | 0.28 | 54.65 (12.81) | <0.01 | 0.34 |
| Men (N = 386) | 18.19 (7.61) | | | 46.72 (21.04) | | | 50.24 (12.69) | | |
| Exercise | | | | | | | | | |
| At least 4 times a week (N = 280) | 17.04 (8.77) | <0.01 | 0.22 | 44.66 (22.12) | <0.01 | 0.23 | 48.81 (13.77) | <0.01 | 0.22 |
| Between 1 and 3 times a week (N = 292) | 18.51 (7.72) | | | 45.73 (20.18) | | | 51.37 (12.05) | | |
| No exercise (N = 888) | 21.83 (8.24) | | | 55.56 (23.36) | | | 55.65 (12.40) | | |
| Nutrition | | | | | | | | | |
| Balanced meals every time (N = 448) | 16.73 (7.87) | <0.01 | 0.33 | 41.63 (18.50) | <0.01 | 0.61 | 47.60 (12.51) | <0.01 | 0.36 |
| Balanced meals sometimes (N = 566) | 20.47 (8.17) | | | 52.33 (23.06) | | | 54.19 (12.19) | | |
| Meals are not balanced (N = 446) | 23.49 (8.12) | | | 60.38 (23.41) | | | 58.49 (11.83) | | |

(continued)

**Table 1.** Continued.

| Groups (samples) | Psychological variable | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| | Stress (PSS-10) | | | Depression (FDI) | | | Anxiety (SSTAI) | | |
| | Average (S.D.) | p-value | effect-size | Average (S.D.) | p-value | effect-size | Average (S.D.) | p-value | effect-size |
| **Do you attend to psychotherapy (online)?** | | | | | | | | | |
| Regularly (N = 260) | 17.89 (7.61) | <0.01 | 0.22 | 43.93 (22.09) | <0.01 | 0.19 | 45.80 (12.56) | <0.01 | 0.17 |
| Only for emergencies (N = 142) | 21.54 (8.14) | | | 52.54 (23.48) | | | 56.19 (12.45) | | |
| No psychotherapy at all (N = 1058) | 22.69 (8.32) | | | 55.71 (23.07) | | | 56.87 (11.27) | | |
| **Quarantine** | | | | | | | | | |
| Yes (not going outside) (N = 1240) | 20.08 (8.50) | =0.08 | 0.12 | 51.39 (22.99) | =0.65 | 0.03 | 53.14 (12.95) | <0.05 | 0.18 |
| No I do go outside, even if rarely (N = 220) | 21.17 (8.34) | | | 52.15 (23.53) | | | 55.40 (12.55) | | |
| **Are elderly in quarantine with you?** | | | | | | | | | |
| Yes (N = 412) | 21.86 (8.04) | <0.01 | 0.27 | 55.56 (23.27) | <0.01 | 0.25 | 55.27 (12.42) | <0.01 | 0.20 |
| No (N = 1048) | 19.61 (8.57) | | | 49.91 (22.81) | | | 52.78 (13.04) | | |
| **Are children in quarantine with you?** | | | | | | | | | |
| Yes (N = 1068) | 20.09 (8.53) | =0.24 | 0.07 | 49.90 (22.00) | <0.05 | 0.10 | 54.36 (13.02) | =0.12 | 0.09 |
| No (N = 392) | 20.67 (8.35) | | | 52.28 (23.41) | | | 53.16 (12.86) | | |
| **Do you have any risk factor for COVID-19?** | | | | | | | | | |
| Yes (N = 692) | 21.53 (8.61) | <0.01 | 0.29 | 55.58 (24.23) | <0.01 | 0.34 | 55.67 (12.63) | <0.01 | 0.33 |
| No (N = 768) | 19.09 (8.20) | | | 47.83 (21.33) | | | 51.52 (12.85) | | |
| **Does your job require you to come outside?** | | | | | | | | | |
| Yes (N = 446) | 20.83 (8.65) | =0.10 | 0.13 | 52.90 (24.29) | =0.26 | 0.07 | 55.11 (12.86) | <0.05 | 0.09 |

(continued)

**Table 1.** Continued.

| Groups (samples) | Psychological variable | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Stress (PSS-10) | | | Depression (FDI) | | | Anxiety (SSTAI) | | |
| | Average (S.D.) | p-value | effect-size | Average (S.D.) | p-value | effect-size | Average (S.D.) | p-value | effect-size |
| Sometimes (N = 332) | 20.48 (7.75) | | | 51.47 (20.68) | | | 53.68 (12.94) | | |
| No (N = 682) | 19.76 (8.70) | =0.06 | 0.08 | 50.61 (23.20) | | | 52.33 (12.83) | | |
| Did you use telemedicine services so far? | | | | | | | | | |
| Often (N = 76) | 18.21 (8.95) | | | 46.00 (24.16) | <0.05 | 0.07 | 51.53 (14.49) | =0.15 | 0.07 |
| Sometimes (N = 146) | 19.23 (7.95) | | | 48.26 (22.97) | | | 52.19 (12.57) | | |
| No (N = 1238) | 20.25 (9.95) | | | 52.22 (22.95) | | | 53.76 (12.84) | | |

Interpretation for Cohen's d (t-test) is: below 0.20 no effect; between 0.20 and 0.50 small effect-size; between 0.50 and 0.80 moderate effect-size; above 0.80 high effect-size. Regarding Cohen's f (one-way ANOVA): below 0.10 no effect; between 0.10 and 0.25 small effect-size; between 0.25 and 0.40 moderate effect-size; above 0.40 high effect-size.

of responders in this category. Five factors had effect sizes above 0.2 for all 3 indicators of mental health: gender, nutrition, exercise frequency, being quarantined with an elder and having perceived risk factors for COVID-19.

Multiple Linear regression revealed that several variables predicted mental health variables. Specifically, stress was predicted by gender, nutrition, quarantine along with an elderly person, exercise frequency, level of education, a job requirement to work outside the home, the use of tele-psychotherapy and age, in order by strength of standardized betas. The coefficient of determination ($r^2$) was 0.23. The protective factors based on the strength of standardized betas were: being a man, having a balanced diet, attending to tele-psychotherapy (or tele-psychological counseling), having children at home during quarantine and higher levels of education. On the opposite side, risk factors for mental illness during quarantine were: being a woman, living with elders, job requirement to work outside the home, carrying any risk factor for COVID-19 and being younger.

In terms of depression, gender, nutrition, presence of children in quarantine with the participant, use of tele-psychotherapy, whether the person carries a perceived risk factor for COVID-19, exercise frequency, level of education, presence of an elderly person in quarantine with the participant, the need to go outside the home due to job commitments and age, respectively. The coefficient of determination ($r^2$) for the depression model was 0.24. Finally, state anxiety was significantly linked to the same variables as depression with the exceptions of the presence of children or elderly in quarantine with the participant. The coefficient of determination ($r^2$) for the SSTAI model was 0.21. Table 2 presents regression coefficients (Beta), $t$-test and $p$-values for variables predicting each psychological dependent variable. Figure 1 presents the dispersion graphs of the three regressions: (a) stress, (b) depression and (c) state anxiety.

Finally, prevalence of participants with possible acute stress based on the criteria of total score above the cut-off point (>2 SD) was 6.9%. Regarding depression, prevalence of possible acute conditions was 4.2% adopting the same criteria (i.e., >2 SD). Prevalence of anxiety was divided according to gender. Women showed prevalence (>2 SD) of 8.9%, whereas men presented a prevalence of 8.4%.

## Discussion

The current study is unique because it identified factors associated with poorer mental health among people in the early stages of state-mandated quarantine. First, women scored significantly higher for stress, depression and state anxiety levels when compared to men. Indeed, there is ample evidence that gender and biological sex have a relationship with mental health (Almeida & Kessler, 1998; McLean & Anderson, 2009; Nolen-Hoeksema, 2001). Such a finding may suggest that psychological care be tailored by gender. The second most relevant

**Table 2.** Results of the multiple linear regressions divided by dependent variable.

| | Multiple linear regression | | |
|---|---|---|---|
| Variables | Beta | t-test | p-value |
| Perceived Stress (PSS-10) | | | |
| (Intercept) | 18.96 | 16.96 | <0.001 |
| Gender | 2.76 | 6.07 | <0.001 |
| Nutrition | 1.82 | 6.34 | <0.001 |
| Are elderly in quarantine with you? | 1.57 | 3.56 | <0.001 |
| Exercise | −1.49 | 5.45 | <0.001 |
| Education | −0.93 | 2.86 | <0.005 |
| Does your job require you to come outside? | 0.75 | 3.24 | <0.005 |
| Do you attend to psychotherapy (online)? | −0.33 | 4.13 | <0.001 |
| Age | −0.17 | 9.52 | <0.001 |
| Depression (FDI) | | | |
| (Intercept) | 51.82 | 15.63 | <0.001 |
| Gender | 6.61 | 5.36 | <0.001 |
| Nutrition | 5.45 | 6.99 | <0.001 |
| Are children in quarantine with you? | −3.87 | 3.19 | <0.005 |
| Do you attend to psychotherapy (online)? | −3.43 | 2.07 | <0.050 |
| Do you have any risk factor for COVID-19? | 3.38 | 2.89 | <0.005 |
| Exercise | −2.68 | 2.88 | <0.005 |
| Education | −2.55 | 2.88 | <0.005 |
| Are elderly in quarantine with you? | 2.54 | 1.99 | <0.050 |
| Does your job require you to come outside? | 1.65 | 2.64 | <0.010 |
| Age | −0.48 | 9.67 | <0.001 |
| State Anxiety (SSTAI) | | | |
| (Intercept) | 41.46 | 25.23 | <0.001 |
| Gender | 4.34 | 6.16 | <0.001 |
| Nutrition | 3.53 | 7.96 | <0.001 |
| Do you have any risk factor for COVID-19? | 2.38 | 3.80 | <0.001 |
| Do you attend to psychotherapy (online)? | −2.20 | 2.32 | <0.050 |
| Exercise | −1.64 | 3.78 | <0.001 |
| Does your job require you to come outside? | 1.63 | 4.56 | <0.001 |
| Education | −0.21 | 2.17 | <0.050 |
| Age | −0.17 | 6.21 | <0.001 |

variable (based on the strength of standardized betas) in the prediction of all three psychological variables was nutrition. A balanced diet and regular eating habits are linked to better mental health indices (Lim et al., 2016). Although exercise appeared as an important factor to predict stress, depression and state anxiety levels (Paluska & Schwenk, 2000), it did not relate as strongly (according to betas) as other sociodemographic and behavioural variables, such as characteristics of people in quarantine or the use of telepsychology.
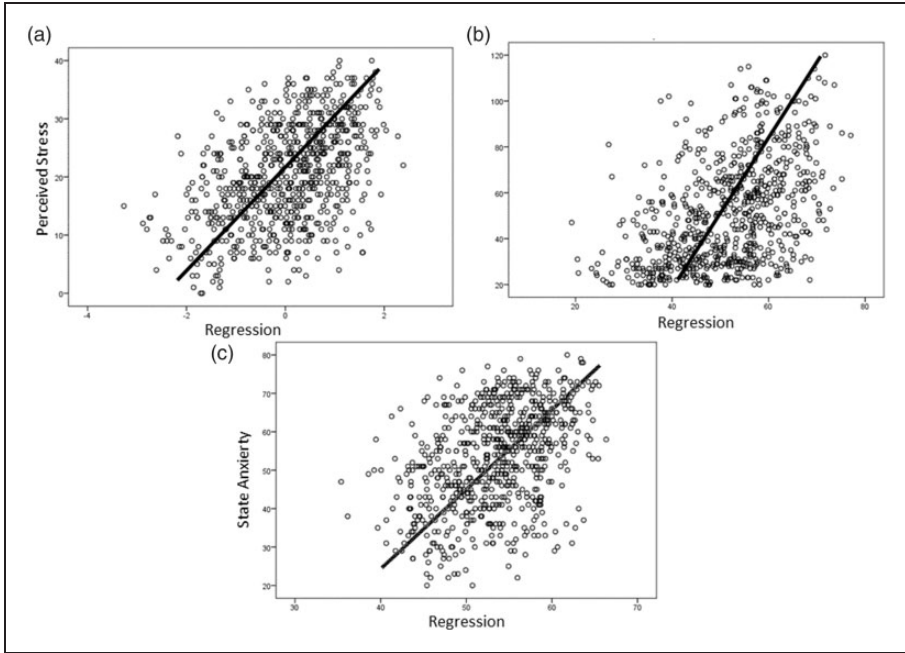
**Figure 1.** Dispersion graphs with line of tendency plotted with the total score of PSS-10, FDI and SSTAI in the axis y and the results of the linear function in the axis x.

Evidence from epidemiological research on COVID-19 suggests that elderly individuals are more susceptible to the virus than other age groups (WHO, 2020; Qiu et al., 2020). The findings depicted here reveal that stress and depression levels are associated with the presence of older people in quarantine with participants. In fact, this variable had the third strongest beta in the PSS-10 multiple regression model. There are at least two explanations. First, the prospect of leaving an elder at home and coming back later is stressful due to the risk of exposing them to the contagion, particularly if the elder has health problems (WHO, 2020). In addition, taking care of the elderly consumes more time dedicated to direct care, coordinating healthcare, cleaning and organizing the house to avoid contamination, among other tasks (Qiu et al., 2020). Also, regarding age-related variables, the presence of children in quarantine with volunteers was, interestingly, a protective rather than a depressive factor. People who had children among them in confinement reported less depression levels than those without children. It is a surprising finding, since taking care of children in quarantine likely involves some stressful tasks (Timmer et al., 2011). On the other hand, perhaps many parents perceive that the condition of their offspring is safer, resulting in decreased worry and/or increased happiness. Age itself is

also a demographic variable that predicts psychological outcomes; however, it is negatively associated and has small correlations in the regressions when compared to other variables. Younger people are slightly more stressed, depressed and anxious during quarantine than those who are older, which actually contradicts the literature (Barros et al., 2017; Christensen et al., 1999). On the other hand, the economic impact of COVID-19, constraints on income and the growing trend of hopelessness among young adults (Qiu et al., 2020) may explain the present findings.

Interestingly, higher levels of education seems to be protective for psychological distress, depression and state anxiety. The current results showed significant differences between participants with graduate school education (Master's and Ph.D. degrees) and those who completed lower levels (bachelor's and high school). Perhaps those with greater education have more resources or are able to garner resources more readily. In line with this, Steele et al. (2007) found evidence that those completing higher levels of education were more likely to seek psychological or psychiatric help. Better psychological health for the more well-educated corroborates with another finding of the present study: the protection associated with tele-psychotherapy. All three dependent variables were partially predicted by participant attendance in tele-psychotherapy (or online psychotherapy). Previous studies have shown the efficacy of this kind of practice (Bolton & Dorstyn, 2015; Lambert et al., 1994; Varker et al., 2019); however, the results depicted here highlight the importance of psychological interventions during quarantine and isolation. In fact, telepsychology seems to be more associated with depression and anxiety levels than exercise, age and education.

Finally, factors relevant for one's personal exposure to the novel coronavirus predicted all 3 indicators of mental health. There is already evidence in the scientific literature that COVID-19 raises levels of distress among people in quarantine also due to the lethal threat it poses to the population and to the person her or himself (Qiu et al., 2020). Two pertinent risk variables were predictive of stress, depression and anxiety: job obligation to leave the home and having perceived risk factors for SARS-CoV-2. Participants whose jobs obliged them to go outside the home to work showed higher stress, depression and state anxiety levels when compared to those who were not required to leave home. Worse mental health was also reported for those who perceived themselves as having risk factors for COVID-19. Recent evidence also implicates several physical factors that render a person more vulnerable to a viral infection: age, obesity, and having medical conditions, such as diabetes, heart diseases, asthma, bronchitis and other breathing disorders, chronic and autoimmune diseases (Wilder-Smith & Freedman, 2020; WHO, 2020). Consequently, participants who classified themselves as having one or more of these illnesses also reported more depression and anxiety than those volunteers who categorized themselves without these vulnerabilities. It is understandable that a disease that is newly emerging, not fully understood by science and poses an objectively real and

lethal threat to people is subjectively perceived as very stressful, especially among those who have a greater risk of infection (Qiu et al., 2020).

Prevalence of potentially clinically-relevant mental illness in the period of data collection among participants were similar to those found by Brazilian normative studies (Cacciari et al., 2016; Filgueiras et al., 2014; Pasquali et al., 1994). The PSS-10 showed that the prevalence of acute stress in the present sample is 6.9% whereas, the Brazilian normative study indicated 7.1%. The number of participants who presented values for depression above the FDI's cut-off point (>2 SD) was 4.2%, similar to the Brazilian norm of 4.0% (Filgueiras et al., 2014) and the prevalence of depression among Brazilians: 3.9% (Hamilton et al., 2015). Accordingly, anxiety, here measured by an instrument for state anxiety, showed prevalence of 8.9% among women and 8.4% among men. This was close to the Brazilian normative data that found a prevalence of 8.6% among women and 8.5% among men. Altogether, there appears to be no practical differences between the current prevalence data and normative data. This being said, the data collection of the present research took place only in the first week of several months of quarantine. Longer exposure to quarantine may result in greater changes in mental health.

Although this research provides an additional step in the understanding of psychological needs during quarantine from COVID-19, it also has several limitations. All data were self-report and not verifiable from other sources. Furthermore, no other psychological and environmental variables were considered, such as personality traits, economic conditions, size of the city of residence and proximity of known COVID-19 contamination. This information might help to clarify possible relationships between psychological, physical, behavioural and demographic dimensions of mental health during quarantine (Brooks et al., 2020; Rubin & Wessely, 2020; Webster et al., 2020; WHO, 2020; Wilder-Smith & Freedman, 2020; Xiao, 2020). Another problem is the design of the study; data were cross-sectional (i.e., no comparison group) and the analysis was comprised of a linear regression technique, which limits inferences about causality. Thus, this paper can only make conclusions about the strength and direction of associations between variables. Future studies would benefit from longitudinal designs.

In contrast from previous studies with quarantined individuals (Brooks et al., 2020; Hawryluck et al., 2004; Jeong et al., 2016; Qiu et al., 2020; Reynolds et al., 2008; Taylor et al., 2008; Wang et al., 2011; Wu et al., 2009), the present study aimed to identify and quantify the strength of associations of various risk factors with mental health outcomes. The results suggest that less educated women who have unbalanced diets, do not exercise, have no psychological aid, work outside the home, are in quarantine with older people, have perceived physical risk factors for COVID-19 contamination and are younger in age are more likely to report higher levels of distress, depression and state anxiety. Effect sizes observed suggest that several predictors were of a moderate magnitude

and may need special consideration: level of education, nutrition, practicing exercise regularly, living with elders in quarantine and perceiving any risk factor for COVID-19. Based on the findings depicted here, mental health services, either public or private, may be able to establish strategies to provide psychological aid and prioritize their services for those at greater risk for developing mental illness.

## Data availability

The datasets presented in this article are not readily available because the Ethical Committee approved this research under the condition of no data sharing even in anonymous conditions. Requests to access the datasets should be directed to Dr. Alberto Filgueiras at: albertofilgueiras@gmail.com

## Declaration of Conflicting Interests

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