

Biocentric development: Studies on the consequences of COVID-19 towards human growth and sustainability

Edited by

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Biocentric development: Studies on the consequences of COVID-19 towards human growth and sustainability

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Table of contents

- 04 **Editorial: Biocentric development: studies on the consequences of COVID-19 towards human growth and sustainability**
Marcus Stueck, Dian Veronika Sakti Kaloeti, Hamidrezah Kankeh, Mehrdad Farrokhi and Mariola Bidzan
- 08 **Social Isolation During COVID-19 Pandemic. Perceived Stress and Containment Measures Compliance Among Polish and Italian Residents**
Jakub Grabowski, Joanna Stepień, Przemysław Waszak, Tomasz Michalski, Roberta Meloni, Maja Grabkowska, Aleksandra Macul, Jakub Rojek, Liliana Lorettu, Iwona Sagan and Leszek Bidzan
- 17 **Financial and Mental Health Concerns of Impoverished Urban-Dwelling Bangladeshi People During COVID-19**
Md. Saiful Islam, Md. Estiar Rahman, Rajon Banik, Md. Galib Ishraq Emran, Noshin Saiara, Sahadat Hossain, M. Tasdik Hasan, Md. Tajuddin Sikder, Lee Smith and Marc N. Potenza
- 29 **The Consequences of COVID-19 Toward Human Growth: The Role of Traumatic Event and Coping Strategies Among Indonesian Sample**
Dian Veronika Sakti Kaloeti, Lusi Nur Ardhiani and Marcus Stüeck
- 39 **Coping Strategy, Social Support, and Psychological Distress Among University Students in Jakarta, Indonesia During the COVID-19 Pandemic**
Zarina Akbar and Maratini Shaliha Aisyawati
- 46 **Psychological Adjustment, Quality of Life and Well-Being in a German and Portuguese Adult Population During COVID-19 Pandemics Crisis**
Adelinda Candeias, Edgar Galindo, Marcus Stueck, António Portelada and Jessica Knietzsch
- 57 **Effects of Psychological Discomfort on Social Networking Site (SNS) Usage Intensity During COVID-19**
Hyeon Jo
- 71 **Longitudinal survey of depressive symptoms among university students during the COVID-19 pandemic in Japan**
Kyoko Nomura, Teiichiro Yamazaki, Eri Maeda, Junko Hirayama, Kyoichi Ono, Masahito Fushimi, Kazuo Mishima and Fumio Yamamoto



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Editorial: Biocentric development: studies on the consequences of COVID-19 towards human growth and sustainability

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biocentric development, COVID-19, sustainability, human growth, Biodanza, Relative Biocentric Health Theory, spirituality and health, biocentric borders

Editorial on the Research Topic

Biocentric development: studies on the consequences of COVID-19 towards human growth and sustainability

This Research Topic on “*Biocentric development and COVID-19*” has two main focuses. Firstly, to publish studies that scientifically elaborate the positive and negative consequences of the COVID-19 situation and, secondly, to make deductions related to biocentric development as an alternative mission search. The focus is not primarily on overcoming the manufactured COVID-19 crisis from an anthropocentric perspective (anthro = human, center = center) but also from a biocentric approach. Why? The global COVID-19 events, climate catastrophes, and countless environmental catastrophes show a pattern, namely, that humans have increasingly detached themselves from nature and its totality through their way of life and inner attitudes. For example, through inner perspectives

- that nature and life are exploitable resources,
- that there is a material world that will grow indefinitely,
- that man is the reference point for all developments, and that all other life forms are subordinate to him.

If one forms the dual expression of these attitudes (dualization) to restore balance, at least mentally, three important biocentric statements emerge:

First, nature and its associated life have an intrinsic value that humans must experience effectively. Toro (2010) described the importance of the inner experience in education, therapy, and personal growth and how to develop it using the biocentric method of “Biodanza.” This method, aiming to increase reverence for life is well-researched (Stueck and Tofts, 2016; Stueck and Villegas, 2018; Stueck et al., 2019).

Second, there is a material and a non-material, spiritual level that needs to be integrated with life and health and which is not a matter of belief but of logical deduction and increasing research (MacDonald et al., 2015; Stueck, 2021; Dewi et al., 2023).

Thirdly, that man is not only the anthropocentric and egocentric reference point of life but there is also a biocentric reference level (bios = life, center = center). This means that there is a connection between outer and inner natural space, as Stueck (2021) stated based on Naess (1989, 1998). In the “Deep Ecology”

approach they postulated that nature, the “complex of living beings,” is unfortunately seen as something separate from humans. Biocentric methods (interventions) to experience and observe the inner natural space are among others, Biodanza and Meditation (see Figure 1, point 9).

What is the biocentric reference level? Schweitzer (1966) already described it as a way of life where individuals live with compassion and respect for all living things—humans, animals, and plants. Toro (2010) developed ideas on a biocentric principle and education, which emphasize about the protection of life and thus the affective connection (empathy) to oneself, others, and all life forms in nature. This includes expanding ethical awareness about the intrinsic value of life and nature at the center of consideration and research. Stueck (2021) defined and studied it in a Relative Biocentric Health Theory (RBHT) related to COVID-19, so called biocentric borders (see Figure 1, number 1), which are external and internal factors that hinder the normal process of autoregulation (see Figure 1, number 2) in the biocentric core (see Figure 1, number 3) of a living system. In humans, this perspective decreases effective communication and empathy for all natural life forms and the empathy for oneself (see Figure 1, number 4) and salutogenesis (see Figure 1, number 5). Research has shown that biocentric borders, like chronic stress, exhaustion, and hypersensitivity, lower the humans' empathic behavior (Stueck, 2008; Stueck et al., 2013). This “dehumanization” because of the biocentric borders (see Figure 1, number 1) of chronic stress and exhaustion, combined with a missing empathy, are accompanied by other affective pathologies. This includes addictions (Kaloeti and Kusnadi, 2022), but also the devaluation of others (racism, discrimination, bullying) (Kaloeti et al., 2021), fears of nature, fears of life, fears to be empathic and an inability to express oneself or to communicate (Toro, 2010). For this reason, further research on a biocentric evidence-based intervention, e.g. “School of Empathy,”

for children and adults would be helpful (Stueck, 2010; Stück, 2013; Widiastara et al., 2018).

Related to this model (see Figure 1), the topic articles in this Research Topic on “Biocentric development and COVID-19” can be categorized into three aspects:

The first aspect is research on Biocentric Borders during COVID-19 (Figure 1, point 1). Biocentric borders can hinder the ethics of coexistence and the deeper connection of human beings with themselves, others, and with nature. In this context, the article by Grabowski et al. found that the associated stress levels during the lockdown in Italy and Poland were related to higher activity levels. Furthermore, it was reported that less isolation correlated with less stress. The importance and the effects of social connection and support in combination with functioning emotional coping strategies on reducing stress, anxiety, and depression were underlined in a second article by Akbar and Aisyawati on this topic.

The second aspect explored by articles in this Research Topic is research about the balance between the internal and external orientation (see Figure 1, point 6) of people's perceptions during COVID-19. In this respect, the article by Nomura et al. is a significant contribution to the importance of counseling to increase reflexive activity (internal orientation) in students in difficult mental situations during COVID-19 to prevent depression and suicide. The better people can reflect on internal states, self-defense mechanisms, and dysregulated non-biocentric attitudes, the healthier they become or remain during COVID-19 (see Figure 1, point 2, 5, 6).

In studies on Relative Biocentric Health Theory (RBHT, Stueck, 2021) during COVID-19, people who developed a higher inner orientation during the pandemic crisis, e.g., by practicing psychotherapy, Biodanza, or meditation, were more connected to their “biocentric core” (Stueck, 2021).

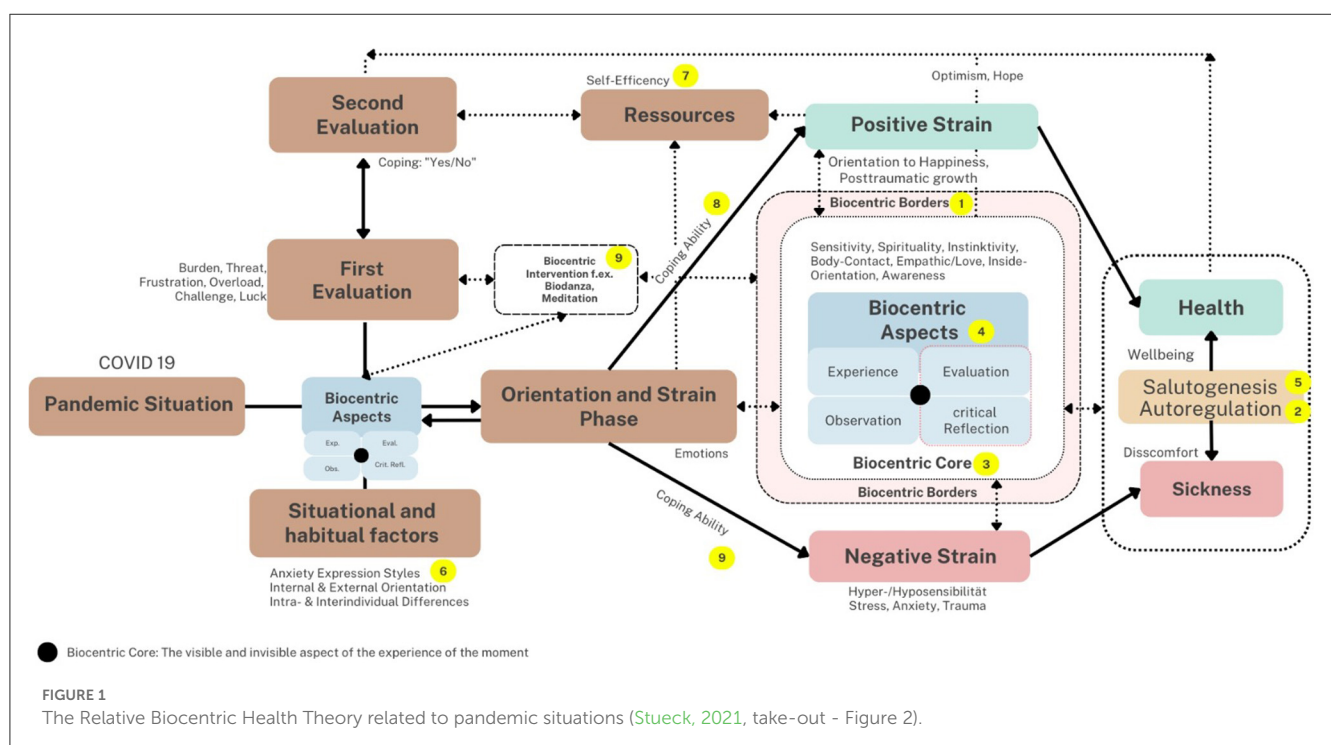


FIGURE 1

The Relative Biocentric Health Theory related to pandemic situations (Stueck, 2021, take-out - Figure 2).

This means they are significantly more peaceful, autonomous, empathic, and capable of love (see Figure 1, point 3, 4). They also show different interpretations of the pandemic situations and less problematic anxiety expression styles, such as fewer sensitizers and displacement patterns (Mueller-Haugk and Stueck, 2023, see Figure 1, point 6). Unfortunately, during the COVID-19 lockdowns, no government-sponsored programs that systematically promoted inner orientation in children and adults and addressed people's inner problems even though scientists suggested the use of reflexive methods to increase self-efficacy in hospital staff (Bidzan et al., 2020, see Figure 1, resources, point 7) or self-management and psychological strategies to overcome difficulties during COVID-19 (Khankeh et al., 2021, 2022, see Figure 1, point 8).

The final aspect explored in this Research Topic includes research on inter- and intra- individual differences during COVID-19: this third category of articles on “*Biocentric development and COVID-19*” concerns people's inter- and intra- individual differences, which should be regarded when intervention strategies are selected because every human being is unique.

Unfortunately, this ability to differentiate has been missing from pandemic management in many countries (Khankeh et al., 2020; Bidzan-Bluma et al., 2021) (see Figure 1, point 6). The third biocentric basic assumption is explored in the topic through three articles. The first article by Candeias et al. concludes that the quality of life, optimism, and wellbeing are affected differently during the pandemic. This depends on the country and age group, suggesting individual differences between cultures and age groups and the need for specific interventions. A second article on this topic, by Islam et al. investigates the particular aspect of coping with COVID-19 and examines public health initiatives in Bangladesh that use biocentric approaches to mitigate the pandemic's potential financial and psychological impact on impoverished urban dwellers in Bangladesh. A third topic article in the context of interindividual differences during COVID-19 by Kaloeti et al. takes up gender

differentiation concerning COVID-19, finding that women in Indonesia were more vulnerable to traumatic reactions.

The seven articles included in this topic indicate that there is a need for further research on these three biocentric aspects and that scientific studies on biocentric fields of action in combination with anthropocentric methods need to be conducted. This will ensure a practical transfer of the biocentric ideas in different working areas, e.g., to treat Long-COVID illnesses or to strengthen biocentric resources and enable humans for biocentric growth and sustainable development.

Author contributions

DK finalized the manuscript. All authors contributed to the conception and design of the editorial, manuscript revision, read, and approved the submitted version.

Conflict of interest

MS was employed by International Biocentric Research Academy (IBRA).

The remaining authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Social Isolation During COVID-19 Pandemic. Perceived Stress and Containment Measures Compliance Among Polish and Italian Residents

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Background: In this study, we analyze the association of social isolation in the first phase of the pandemic with perceived stress among residents of Poland and Italy with a look at how these populations adjust to and comply with implemented regulations, guidelines, and restrictions.

Materials and Methods: Internet survey with Perceived Stress Scale (PSS-10) and questions regarding mobility patterns, attitude, and propensity to adjust toward the implemented measures and current health condition was made among Polish and Italian residents (Cronbach's alpha 0.86 and 0.79, respectively). The sample size was 7,108 (6,169 completed questionnaires in Poland and 939 in Italy).

Results: The Polish group had a higher stress level than the Italian group (mean PSS-10 total score 22,14 vs 17,01, respectively; $p < 0.01$). There was a greater prevalence of chronic diseases among Polish respondents. Italian subjects expressed more concern about their health, as well as about their future employment. Italian subjects did not comply with suggested restrictions as much as Polish subjects and were less eager to restrain from their usual activities (social, physical, and religious), which were more often perceived as "most needed matters" in Italian than in Polish residents.

Conclusion: Higher activity level was found to be correlated with lower perceived stress, but the causality is unclear. Difference in adherence to restrictions between Polish and Italian residents suggests that introducing similar lockdown policies worldwide may not be as beneficial as expected. However, due to the applied method of convenience sampling and uneven study groups, one should be careful with generalizing these results.

Keywords: SARS-CoV-2, quarantine, spatial mobility, guideline adherence, physical activity, social behavior, physical distancing, mental disorders

INTRODUCTION

During the early months of 2020, the first coronavirus disease 2019 (COVID-19) infections were recorded in all European countries with Europe being considered by the WHO as the active center of the COVID-19 pandemic.¹ Following a rapid increase of new cases and deaths, preventive measures to mitigate the pandemic were taken *ad hoc* by all countries. These measures often included the imposition of lockdowns with restrictions varying across the continent. As of 18th March, more than 250 million people were in lockdown in Europe.²

Prolonged social isolation is known to be associated with increased morbidity and mortality in the human population. In terms of mental health, it leads to depression, anxiety, suicidality, personality disorders, psychoses, and deterioration of cognitive functions (Cacioppo et al., 2011; Wang et al., 2017; Zorzo et al., 2019; Chu et al., 2020). Recent studies confirm that current long-term health threats and imposed deprivation of social contacts associated with a feeling of lack of control lead to a significant increase in mental health issues in the global population (Gobbi et al., 2020). Other risk factors for the deterioration of mental condition involve female gender, younger age, and lack of approval for the policy of the country toward the COVID-19 pandemic. Insomnia—as a possible prodrome for anxiety and depressive disorders—was the most commonly recorded issue.

Pandemic Management Theory (PMT), developed by Stueck (2021), suggests a complex mechanism behind the mental health burden pointing to a possible role of several fears in impacting individual and collective coping processes. Fears of losing autonomy, getting sick, losing energy, aggression by others, or fear of the future are postulated to significantly exceed the actual fear of death, which is contrary to what is observed in individuals with an experience of trauma caused by a terror attack. Deprivation of physical or eye contact and restricted field of vision due to mask-wearing are also suggested to lead to empathy and emotional dysregulation (Stueck, 2021). According to PMT, difficulty in sustaining biocentric connections of individuals to themselves, others, and nature during the pandemic may play a crucial role in the development of anxiety, depression, stress, and post-traumatic stress, loneliness, social isolation, and stigma. Similar observations were made by the study of Super et al. (2020) where mental health condition was predicted by the sense of individual and national coherence and the presence of social support.

Only small differences in the proportions of psychiatric outpatients reporting worsening of their mental condition were observed between European countries (e.g., 53.72% for Poland and 48.86% for Italy) (Gobbi et al., 2020). This remains not fully understandable, as the course of the pandemic, the socioeconomic or cultural backgrounds, and the imposed

restrictions across Europe varied significantly between the countries and should therefore lead to observed differences in the level of distress. Several studies show that the overall functioning deterioration rates and experienced stress levels during the COVID-19 outbreak are very high across the general population (Gualano et al., 2020; Pakenham et al., 2020; Pieh et al., 2020; Ares et al., 2021; Tan et al., 2021), and are associated, among others, with the loss of job and social support, fear of infection, change of lifestyle, and isolation (Dymecka et al., 2020). Still, little is known on predispositions to mental health deterioration and the presence of any possible protective factors. Furthermore, the lack of comparative cross-country studies evaluating stress and lockdown compliance (Castex et al., 2020) makes it difficult to draw reliable conclusions on the positive and negative effects of the imposed restrictions.

Considering the aforementioned differences across countries and their inhabitants, it seems that introducing similar or identical policies across different regions of the world may not be as beneficial as initially expected, with varied short- and long-term consequences for physical and mental health. Furthermore, “flattening the curve” will not be achievable if the introduced regulations are met with low compliance due to low social acceptability. In our study, we compare the association of social isolation in the first phase of the COVID-19 pandemic with perceived stress among residents of Poland and Italy with a look at how these populations adjust to and comply with implemented regulations, guidelines, and restrictions. These two countries were chosen for analysis due to cultural differences and a significant contrast in the severity of the first wave of pandemic (**Supplementary Figures 1, 2**) (Dong et al., 2020; Roser et al., 2020), to verify whether the above-mentioned reasons impacted compliance to introduced lockdown policies. Furthermore, the survey was meant to give an initial look at the possible association of applied restrictions (similar in Poland and Italy) leading to social isolation with increased stress perception in different sociocultural groups.

MATERIALS AND METHODS

Participants and Procedure

Being a part of a larger analysis on spatial mobility, this study was based on an internet survey made between adult Polish and Italian residents during the first wave of the COVID-19 pandemic (April–May 2020). The distribution of the survey was made through the national and local media, websites of individual regions and provincial cities, social media, and university newsletters with the goal of achieving country-wide responses. It also partially relied on virtual snowball sampling. Participants provided electronic informed consent prior to the survey and were free to quit it at any time. This study complied with all the ethical guidelines and standards for online surveys with human participants, in accordance with the local legislations. The study was conducted in accordance with the ethical principles of the Declaration of Helsinki.

¹Europe is the new epicenter of coronavirus pandemic: WHO. Accessed January 26, 2021. <https://nypost.com/2020/03/13/who-says-europe-is-new-epicenter-of-coronavirus-pandemic>

²Italy records its deadliest day of coronavirus outbreak with 475 deaths | World news | The Guardian. Accessed January 26, 2021. <https://www.theguardian.com/world/2020/mar/18/coronavirus-lockdown-eu-belgium-germany-adopt-measures>

The sample size was 7,108 with 6,169 completed questionnaires in Poland (77% females vs. 23% males) and 939 in Italy (62.8% females vs. 37.1% males). Detailed sociodemographic data can be found in **Table 1**. We have gathered information only on the country of residence, not on the nationality of respondents, as the basis of the study was to analyze the spatial mobility changes as a reaction to the implementation of governmental restrictions and the course of the pandemic. While COVID-19 infection and lethality rates differed greatly between the two countries in the aforementioned period (**Supplementary Figures 1, 2**) (Dong et al., 2020; Roser et al., 2020), the applied lockdown regulations were similar. At the time of the survey, the following restrictions were in force in both countries: closures (all public and private educational institutions, shopping malls, public events, entertainment and recreation facilities, and cultural institutions), limitations (public gatherings, public transport, restaurants, and travel), and warrants (social distance, civil quarantine, covering of mouth and nose, border closures, and controls). Detailed chronological information on implemented rules and regulations in Poland and Italy can be found in the **supplementary material** [**Supplementary Table 1** based on Pinkas et al. (2020) and updated by authors of this manuscript; **Supplementary Table 2**] (Governo Italiano Presidenza del Consiglio dei Ministri, 2021).

Measures

The study consisted of three main parts. The first part was a sociodemographic questionnaire, including questions on current health condition and financial situation (items and possible answers can be found in **Table 1**). The second part was based on a questionnaire with five possible Likert-type scale responses (Likert, 1932). For respondents' mobility patterns, attitude, and propensity to adjust toward the implemented measures and fears regarding health and economics, possible answers included "definitely agree," "mostly agree," "neither agree, nor disagree," "mostly disagree," and "definitely disagree." Pessimism and optimism as traits were self-assessed using 1–5 scale, where 1 was described as pessimistic and 5 as optimistic. Questions regarding current respiratory tract infections and current or past COVID-19 infections in respondents and their close ones had possible "yes" and "no" answers. The final part of the survey was the administration of the Perceived Stress Scale (PSS-10) (Cohen et al., 1983) in its standard timespan version with the scoring of items 4, 5, 7, and 8 reversed. Polish and Italian translations were used.

Statistical Strategy

Survey data were collected online using Google Forms (Google Inc., United States) and subsequently exported to Excel spreadsheets (Microsoft, United States). Statistical analysis was performed using STATISTICA 10.0 software (StatSoft Inc., United States). All of the quantitative variables were tested using Kolmogorov–Smirnov test, for meeting the criteria of a normal distribution (Gaussian distribution). Depending on whether the variable met the normality condition, appropriate statistical tests were applied at further stages. For comparisons between two groups, the parametric *t*-test or non-parametric Mann–Whitney *U*-test was used. For Gaussian data, comparing several groups,

we used the one-way ANOVA. If the result was significant, for particular group differences, we ran *post hoc* Scheffé's test (to minimize the potential unequal sample size bias). For comparing qualitative survey data, Pearson's chi-squared test was used along with the calculation of observed frequencies (with appropriate Yates' correction for small observed frequencies when necessary).

Reliability calculations of the PSS-10 questionnaire were made using statistical software MedCalc, version 15.8 (MedCalc Software Bvba, Ostend, Belgium). We calculated Cronbach's alpha with raw variables along with the correction tool for scale reversal.

The statistically significant threshold level in all calculations was set at $p < 0.05$.

RESULTS

Sociodemographic data of Polish and Italian respondents, including several significant differences between study groups, are shown in **Table 1**. The percentages apply to the total number of participants who answered a specific question, not the whole study group (questions could be left unanswered).

Both language versions of PSS-10 questionnaires had a similar reliability coefficient. Cronbach's alpha for the Polish version of the PSS-10 questionnaire was 0.86 and for the Italian version 0.79.

Results show higher stress levels in the Polish group than in the Italian responders with a mean PSS total score of 22.14 vs. 17.01, respectively, and $p < 0.01$ (**Table 2**). This significant distinction also applies to all sociodemographic subgroups (**Table 1**) and all items of PSS-10 except for item 4 regarding confidence about one's ability to handle personal problems (**Table 2**). The highest stress level was observed in females, younger people, single, with an intermediate level of education (junior high school or secondary), living in larger households, with work suspended due to pandemic, and those assessing their health or financial situation negatively.

In **Figure 1**, we present significant differences in complying with restrictions implemented by both governments. Since a major disparity between the countries was observed, showing much higher levels of compliance with restrictions among the Polish respondents, the data were double-checked for survey translation and statistical errors. For all presented specific activity types, *p*-value was estimated to be lower than 0.01. There were no significant differences in how the respondents self-assessed their need to leave the house. Compliance with restrictions and, consequently, lower declared activity were generally associated with higher PSS scores in the whole study group (**Figure 2**).

Other results show a greater prevalence of chronic diseases among Polish respondents (34.79 vs. 19.39%, $p < 0.0001$). Italians, on the other hand, more frequently expressed concern about their own health (64.15 vs. 53.38% Polish residents, $p < 0.0001$), as well as about their future employment (68.91 vs. 55.14%, $p < 0.0001$). Respondents diagnosed with a chronic disease more frequently expressed concern about their own health than those without such condition (67.75 vs. 48.49%, $p < 0.0001$). Similar attitudes were observed in answers regarding worries about the health of significant others (91.51% Italians vs. 90.55% Poles, $p = 0.30$), financial stability (74.23 vs. 75.78%

TABLE 1 | Sociodemographic characteristics of the respondents.

	Polish residents (N = 6,169)	PSS score (mean) ± SD	Italian residents (N = 939)	PSS score (mean) ± SD	P-value
Sex					
Female	4698 (77%)	22,88 ± 7,37	587 (62,8%)	18,10 ± 7,37	<0,0001
Male	1402 (23%)	19,66 ± 7,69	347 (37,1%)	15,23 ± 7,69	<0,0001
Age					
18–24	1945 (31,5%)	23,32 ± 7,64	91 (9,7%)	20,65 ± 7,07	<0,0001
25–34	2034 (33%)	21,95 ± 7,72	243 (25,9%)	18,00 ± 6,75	<0,0001
35–44	1270 (20,6%)	21,45 ± 7,47	203 (21,6%)	16,80 ± 7,72	<0,0001
45–54	552 (8,9%)	21,35 ± 7,19	184 (19,6%)	15,88 ± 6,52	<0,0001
55–64	259 (4,2%)	20,76 ± 6,27	180 (19,2%)	15,52 ± 6,36	<0,0001
65–74	95 (1,5%)	19,99 ± 6,37	38 (4%)	14,97 ± 6,77	<0,0001
75 +	14 (0,2%)	19,93 ± 9,04	0	N/A	
Education					
Higher	4194 (68%)	21,72 ± 7,54	599 (63,4%)	16,74 ± 6,9	<0,0001
Secondary	1821 (29,5%)	23,13 ± 7,60	290 (30,7%)	17,56 ± 7,16	<0,0001
Vocational	65 (1%)	20,32 ± 7,27	21 (2,2%)	13,81 ± 7,22	<0,01
Junior high school	76 (1,2%)	23,66 ± 7,02	34 (3,6%)	19,09 ± 7,64	<0,01
Primary	13 (0,2%)	20,31 ± 5,12	0		
Marital status					
Single	2690 (43,6%)	22,42 ± 7,67	266 (28,2%)	18,20 ± 7,07	<0,0001
Married/long-term relationship	3166 (51,3%)	21,92 ± 7,51	613 (65%)	16,62 ± 7,01	<0,0001
Divorced	255 (4,1%)	22,03 ± 7,40	49 (5,2%)	15,47 ± 6,73	<0,0001
Widowed	58 (0,9%)	21,86 ± 6,72	15 (1,6%)	17,13 ± 6,86	<0,05
Employment status					
Employment contract	2943 (51,2%)	21,43	472 (64,1%)	16,35 ± 7,02	<0,0001
Mandate contract	357 (6,2%)	23,34	11 (1,5%)	16,36 ± 9,31	<0,05
Self-employment	477 (8,3%)	21,65	0	N/A	
Pension	149 (2,6%)	20,81	50 (6,8%)	15,38 ± 6,28	<0,0001
Student	1630 (28,3%)	23,17	140 (19,0%)	20,06 ± 7,01	<0,0001
Unemployed	197 (3,4%)	23,89	63 (8,6%)	19,03 ± 6,96	<0,0001
Type of settlement					
City over 500,000 residents	2249 (36,5%)	21,91 ± 7,81	92 (9,8%)	17,23 ± 7,07	<0,0001
City 150,000–500,000 residents	1894 (30,7%)	21,89 ± 7,48	96 (10,2%)	17,65 ± 7,43	<0,0001
Town 50,000–150,000 residents	604 (9,8%)	23,06 ± 7,42	385 (41%)	17,37 ± 6,67	<0,0001
Town under 50,000 residents	730 (11,8%)	22,64 ± 7,54	150 (16%)	16,03 ± 6,96	<0,0001
Village/rural area	692 (11,2%)	22,24 ± 7,12	217 (23,1%)	16,69 ± 7,55	<0,0001
Number of people in household					
1	664 (10,8%)	21,58 ± 7,83	132 (14,1%)	16,84 ± 7,08	<0,0001
2	1998 (32,4%)	21,51 ± 7,74	259 (27,6%)	16,2 ± 7,05	<0,0001
3	1473 (23,9%)	22,43 ± 7,42	239 (25,5%)	17,52 ± 6,85	<0,0001
4	1409 (22,8%)	22,91 ± 7,41	241 (25,7%)	17,17 ± 7,24	<0,0001
5 and more	625 (10,1%)	22,34 ± 7,26	67 (7,1%)	18,28 ± 7,26	0,0002
Work during pandemic					
Work from home	2582 (41,8%)	21,38 ± 7,38	424 (45,1%)	16,93 ± 7,03	<0,0001
Work from office (as before)	931 (15,1%)	21,16 ± 7,60	143 (15,2%)	14,71 ± 6,71	<0,0001
Work suspended	932 (15,1%)	23,63 ± 7,62	151 (16%)	18,3 ± 6,58	<0,0001
Not applicable	1724 (27,9%)	23,00 ± 7,59	223 (23,7%)	17,78 ± 7,28	<0,0001
Household financial situation					
Live very well	1543 (25,0%)	20,32 ± (7,93)	117 (12,4%)	16,12 ± 6,76	<0,0001
Doing fine	3589 (58,2%)	22,22 ± (7,32)	599 (63,6%)	16,71 ± 6,87	<0,01
Hardly manage	716 (11,6%)	24,88 ± (6,85)	163 (17,3%)	18,98 ± 7,53	<0,0001
Cannot handle this situation	134 (2,2%)	26,81 ± (7,21)	19 (2,0%)	18,21 ± 9,08	<0,0001

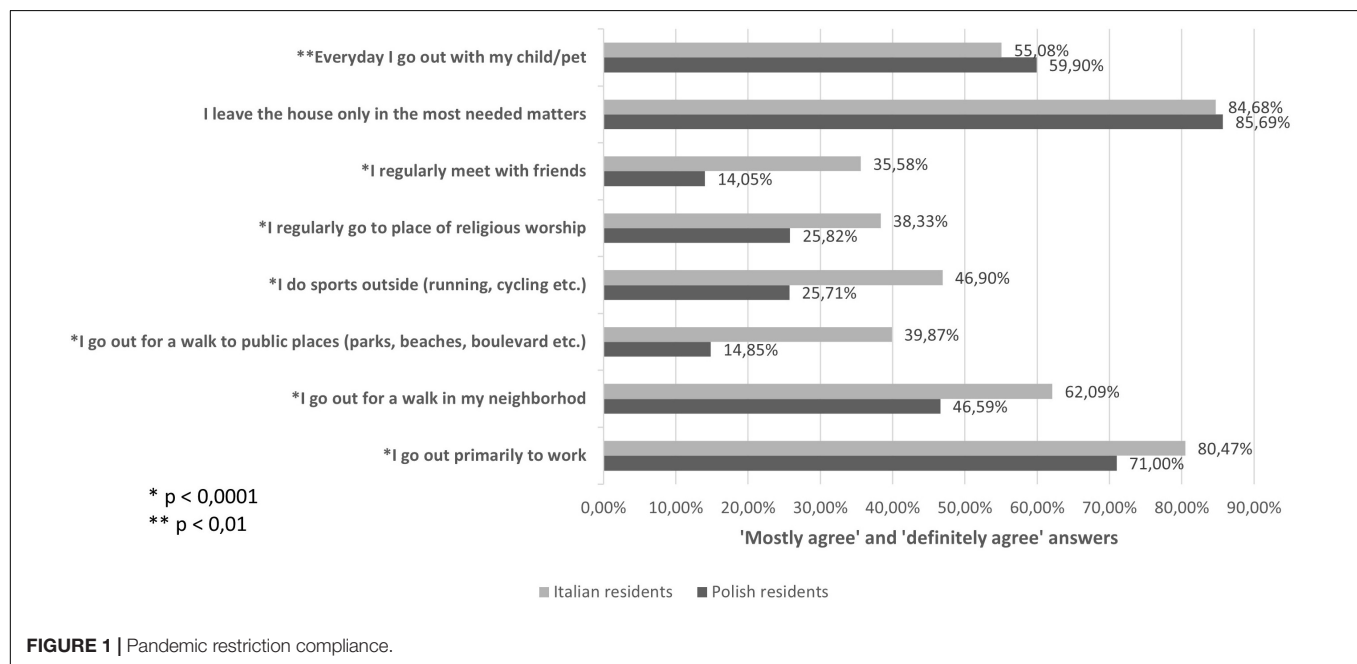
(Continued)

TABLE 1 | Continued

	Polish residents (N = 6,169)	PSS score (mean) ± SD	Italian residents (N = 939)	PSS score (mean) ± SD	P-value
Self-assessed health status					
Very good	2435 (39,5%)	19,66 ± (7,86)	271 (28,7%)	14,18 ± 7,1	<0,0001
Good	2911 (47,2%)	22,85 ± (6,82)	471 (49,9%)	17,32 ± 6,51	<0,01
Average	719 (11,7%)	26,73 ± (6,01)	160 (17,0%)	19,69 ± 6,14	<0,01
Bad	87 (1,4%)	28,7 ± (6,87)	34 (3,6%)	20,97 ± 7,68	<0,0001
Very bad	17 (0,3%)	29,59 ± (9,98)	7 (0,7%)	25,71 ± 11,61	0,29

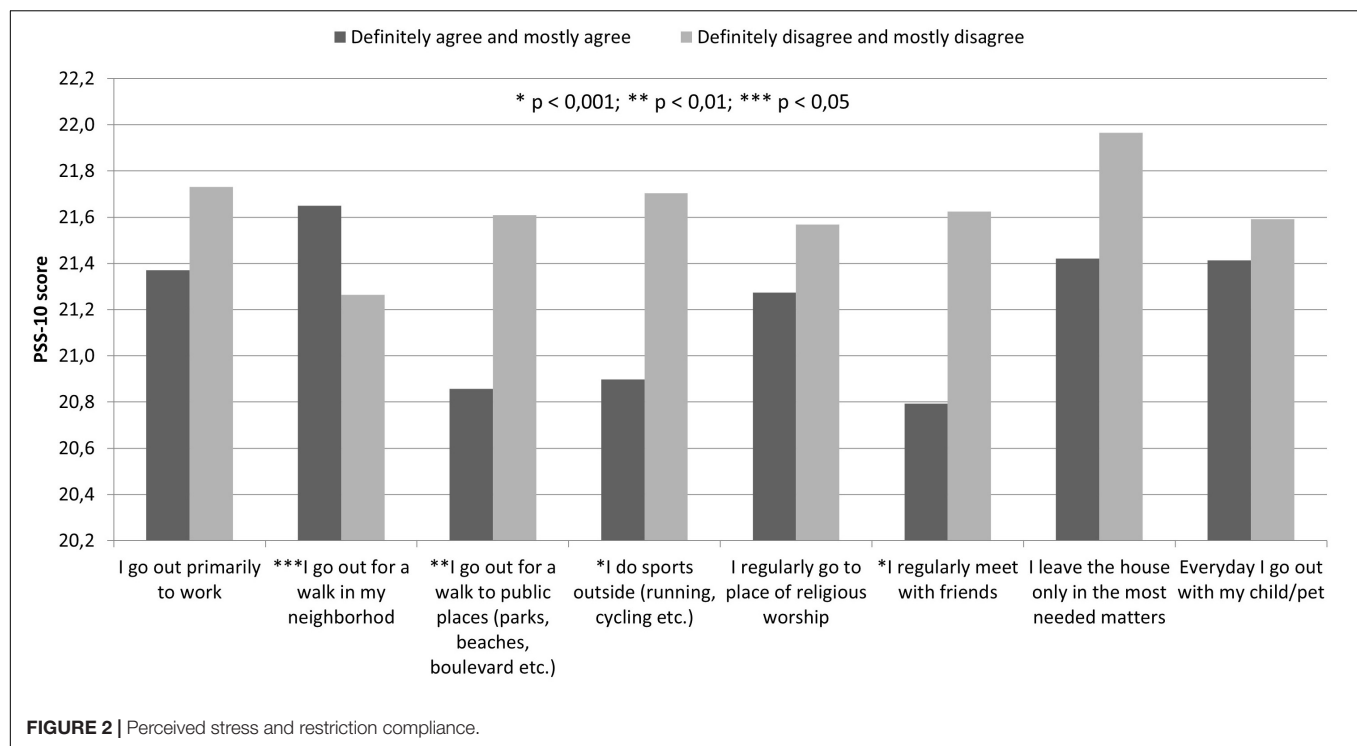
TABLE 2 | Perceived Stress Scale (PSS-10) scores in Polish and Italian respondents.

	Polish residents (N = 6169)		Italian residents (N = 939)		P-value
	mean	SD	Mean	SD	
PSS total score	22,14	7,57	17,01	7,04	<0,01
PSS item					
1. Been upset	2,23	1,08	1,61	1,06	<0,01
2. Unable to control	2,09	1,26	1,43	1,25	<0,01
3. Nervous-stressed	2,60	1,05	1,48	1,20	<0,01
4. Felt confident (R)	1,92	1,20	1,86	1,19	0,05
5. Things your way (R)	2,58	0,92	2,14	1,05	<0,01
6. Could not cope	1,77	1,24	0,98	1,21	<0,01
7. Control irritations (R)	2,21	1,11	2,01	1,21	<0,01
8. On top of things (R)	2,70	0,93	2,77	0,91	<0,05
9. Been angered	2,23	1,33	1,50	1,29	<0,01
10. Could not overcome	1,82	1,27	1,40	1,26	<0,01



consequently, $p = 0.30$), economic situation in the country of residence (94.69 vs. 94.09%, $p = 0.47$), and global economy (88.42 vs. 88.94%, $p = 0.63$). In self-assessment of personality traits, 55.19% Italian residents and 50.5% Polish residents described themselves as prevalently optimistic ($p < 0.05$). Only a small

number of respondents admitted to having been diagnosed with COVID-19 (0.21% in the whole study group), having respiratory tract infection symptoms (6.02%), or having a close relative with current respiratory tract infection (6.14%), while 1.87% of the subjects confirmed the COVID-19 infection in their relatives.



DISCUSSION

To our best knowledge, this is the first study based on a relatively large sample that compares stress level and lockdown compliance between different countries. The reported perceived stress level measured by PSS-10 scale was significantly higher for Polish than for Italian residents but remained above average in both groups during the first wave of the COVID-19 pandemic. This tendency was observed among all sociodemographic subgroups. Compliance to lockdown restrictions was significantly higher among respondents based in Poland in comparison with those living in Italy despite the much more severe course of the first pandemic wave in the latter country.

We observed a relatively higher prevalence of chronic diseases in Polish residents, which could be a possible explanation of the obtained results, as the presence of somatic illness was associated with the actual level of worrying about one's health. On the other hand, Italian residents were those who actually expressed more concern about their health or employment with no significant differences regarding other possible sources of distress between the two groups. Furthermore, as mentioned before, Italy faced a much more extreme situation with several new cases of disease and deaths reported every day in dramatic media coverage, which could also play a role in aggravating perceived stress (Wheaton et al., 2021). One possible explanation for observed distinctions may be that during the study, residents of both countries were in various phases of adaptation according to PMT (Stueck, 2021) when actual fear of death in people in Italy (rather than hypothetical at that time in Poland) switched the survival instinct into a mental defense strategy (Becker, 2021). Such fear may impact one's perception of restriction oppressiveness,

making them seem more acceptable (Dymecka et al., 2020) and consequently causing less distress.

Major differences were also observed between the two countries with regard to lockdown policy compliance. Results show a greater overall activity (physical, social, religious) and lower compliance among Italian residents compared with Polish residents during the first wave of the pandemic. At the same time, both groups perceived their pursued activity as "most needed matters." This distinction between views of social, religious, and health needs suggests possible personality trait-related differences between inhabitants of countries. The contrast in outdoor activity may also be partly explained by different weather conditions during the spring when the study was conducted. Higher temperatures in Italy compared with those in Poland, together with cultural factors and differences between countries in ways of spending time outside homes, could make it more difficult to keep Italians indoors in April and May 2020. According to Google mobility trends,³ a decrease in spatial mobility was observed in both countries during the first wave of COVID-19 pandemic. The decrease was much deeper in Italy and lasted longer than in Poland. While it may seem contradictory to our findings, several limitations of assessing mobility by mobile phone data were raised, including limited data in internet-enabled or low cell-tower-density areas and selection bias (Grantz et al., 2020). The former may be a significant issue in our sample, considering differences in types of settlement between Polish and Italian groups. Furthermore, the Google mobility data are not directly comparable between countries with a difference in the base level of activity in starting point in each country. If in Italy the spatial

³<https://ourworldindata.org/covid-mobility-trends>

mobility was higher than in Poland before March of 2020, the drop in mobility may have been deeper during the first weeks of lockdown restrictions in relative values, even if absolute values were similar or lower.

Joint data for residents of both countries show that higher compliance is associated with higher levels of stress (**Figure 2**), but the causality is unclear. Increased stress with fear of contagion may prevent people from leaving home. On the other hand, imposed restrictions, closures of workplaces, recreation grounds, and forced social isolation are known to increase stress levels, for instance, as a result of deprivation of physical closeness (Stueck, 2021) or by limiting physical activity (López-Valenciano et al., 2021; Ruiz et al., 2021). With possible varying personality traits between residents of both countries (McCrae et al., 2005; Schmitt et al., 2007) and, consequently, different attitudes toward pandemic and lockdown policies (Schaller and Murray, 2008; Barceló, 2017), this may be one of the reasons behind perceived stress-level differences between the two discussed countries, although the actually imposed restrictions were similar in Poland and Italy at that time (**Supplementary Tables 1, 2**). One should also consider the possible impact of differences in the level of citizen trust in government between the two countries (OECD, 2021). While the declared trust in governmental institutions—relatively higher among Italian citizens—was not followed by greater compliance with the imposed measures, it may be associated with higher acceptability (and consequently lower stress levels) in those who pursued the local restrictions.

Both in the case of residents of Poland and Italy, the higher stress level was correlated with worse financial, occupational, and health situation—variables that are ubiquitously expected to be the most impacted by the development of pandemic (Heanoy et al., 2021). In both countries, stress was more prevalent among subjects outside a committed relationship, which may be associated with anxiety of not being able to expect any assistance in case of falling ill. However, people living in larger households were also prone to stress, perhaps by acknowledging the greater risk of disease dissemination among their close ones (Heanoy et al., 2021), by recognizing the family as a possible source of contagious disease transfer, or by simply feeling distressed because of forced isolation with a large group of people in a single household.

In Italy, residents of larger settlements had higher PSS scores than those living in small towns and in rural areas, while in Poland the highest level of stress was reported by people living in towns up to 150,000 inhabitants. These results may be a derivative to different fears among populations of these two countries. At the time of this study, Italy was facing a rapid increase of new cases and COVID-19-related deaths (Dong et al., 2020). The spread of the disease was causing a greater threat to people living in larger communities. On the other hand, Poland with few COVID-19 cases was struggling mainly with consequences of national quarantine, leading to financial instability and increasing unemployment (Główny Urząd Statystyczny, 2021) and deprivation of social contacts. In this case, living in a larger city, with greater perspectives of finding work and larger chances of sustaining social life, could be a reassuring

circumstance. Moreover, people living in rural areas of Poland have stronger social ties and usually work in agriculture, a sector with comparably stable employment (RynekPracy.org, 2021).

The lowest PSS scores were observed in older, less educated respondents, in those who resided with only one other person, and in people who continued with their jobs on-site without shifting to remote work. Age seems to be a general protective factor for stress during pandemic (Bidzan-Bluma et al., 2020; Ruiz et al., 2021), as may be the lack of education in a new situation that requires analytical and interpretational skills to assess potential threats, although dominating evidence is to the contrary (Heanoy et al., 2021). Keeping one's job intact while maintaining social contacts at work is also suggested to be protective against stress (Heanoy et al., 2021).

Limitations

We recognize several limitations to this study, such as adopting the form of an open internet survey and its cross-sectional characteristics. Due to the difficulties associated with the first wave of pandemic and imposition of strict lockdowns in both countries, we adopted a form of convenience sampling with virtual snowball features with all their reliability limitations. Trying to minimize the sampling bias, various ways of reaching respondents were used (as described in Section 2.1) with the goal of achieving the most numerous samples possible, representing all relevant sociodemographic subgroups. At the end of May and at the beginning of June of 2020, the most significant lockdown restrictions were being lifted, which forced us to end the recruitment and therefore limit the number of responses. The responsiveness rates were different in Poland and Italy within the two-month period, resulting in uneven study groups. Although statistical methods were adopted to limit this distinction, one should be careful when generalizing the results with regard to the population in both countries and when interpreting the comparative differences. This is especially true for the Italian residents' group, where the lower number of respondents, despite the greater total population, significantly limits the representativeness of samples.

The data were collected while both countries were facing a distinct pandemic course, with the first cases in Italy being reported over 1 month earlier than in Poland (**Supplementary Figures 1, 2**). Furthermore, there are several significant sociodemographic differences between the two groups (**Table 1**), with a large overrepresentation of females among respondents of both countries. No information on pre-pandemic perceived stress differences between samples of Polish and Italian residents is available, which will enable the comparison of the lockdown levels of stress to a baseline.

Moreover, we failed to fully identify the actual employment status of our respondents by not pursuing distinction between the long-term unemployed and those who had lost their jobs because of the imposed restrictions, which may have a significant effect on the perceived stress (Heanoy et al., 2021). Specific occupation of study participants was not evaluated. Apart from a brief self-reported distinction between pessimism and optimism traits, attitudes that are postulated to play a role in the development of

stress reactions (Schou-Bredal et al., 2021), no other individual personality traits or states were analyzed in this study. While Ranieri et al. (2020) suggested that personality dimensions do not actually mediate distress or increase the risk for post-traumatic stress disorder, it seems that at least in certain groups, self-efficacy is a protective factor against stress during the pandemic (Bidzan et al., 2020).

Comorbidities were assessed only with regard to their presence; no data on specific conditions were gathered. Severe somatic condition or disability of respondents or among their families (over 90% of the subjects were worried about the health of their close ones) seem to impact the process of psychological and social adaptations to the pandemic (Khasawneh, 2020). Finally, we evaluated the respondents only with regard to their place of residence, not nationality nor migration status—factors that may also potentially play a role in stress adaptation mechanisms (Lanzara et al., 2019).

Future Outlook

Possible directions for future studies involve exploring the data we omitted as described in the “Limitations” section. Comparison of stress levels of Polish and Italian residents and coping mechanisms in the coming months and years of the pandemic may also shed light on the possible explanation of the differences observed in this study. Further research comparing countries and/or regions in a similar stage of the pandemic may allow the elimination of some of the confounding factors.

CONCLUSION

Despite several limitations to this study, significant differences between Polish and Italian residents in perceived stress level and compliance with lockdown policies suggest that we should be careful in overgeneralizing the impact of the pandemic and social isolation. While residents of some countries and world regions seem to adapt easily to various restrictions, simple copy-paste strategies may not be that beneficial. Potential short- and long-term effects of prolonged stress due to social isolation may eventually lead not only to severe mental and somatic health consequences but also ultimately to omnipresent non-compliance and movements such as the Polish “entrepreneur’s rebellion.”⁴ Furthermore, a thorough look at the perceived consistency of pandemic policy measures may reveal their possible impact on the efficiency of social isolation and anxiety levels observed in the two countries. Radical and coherent state

⁴Spontaneous movement in Poland opposing government restrictions. Restaurants, nightclubs, gyms, and other facilities were opened despite interdiction by either using legal legerdemains or directly breaking the law.

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intervention significantly helped to contain the virus in China and other East Asia countries, but at the same time, this efficient solution could not be replicated with success in other regions of the world. While absolutely not discouraging governments from taking multiple preventive measures to stop the spread of the COVID-19 pandemic, we rather suggest that a tailor-made policy in each country may be more beneficial than a simple replication of solutions from other regions of the world.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

Ethical review and approval was not required for the study on human participants in accordance with the local legislation and institutional requirements. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

JS, TM, PW, MG, and JG contributed to conception and design of the study. AM, JR, RM, LL, and JG translated the survey. JG selected the data for analysis, created tables, and wrote the first draft of the manuscript. PW and JS did the statistical analysis. PW and JG created figures. JS, AM, RM, and JG created **Supplementary Material**. AM, JR, and JG did literature search. All authors distributed the survey and contributed to manuscript revision, read, and approved the submitted version.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2021.673514/full#supplementary-material>

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Financial and Mental Health Concerns of Impoverished Urban-Dwelling Bangladeshi People During COVID-19

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Background: The COVID-19 pandemic has impacted the physical, mental and financial health of many individuals. Individuals living in impoverished crowded settings may be particularly vulnerable to COVID-19-related stressors. How substantially marginalized groups like impoverished urban-dwelling individuals have been impacted during this pandemic is poorly understood. The present study aimed to investigate the associated factors of financial concerns and symptoms of depression and posttraumatic stress disorder (PTSD) during the COVID-19 pandemic among impoverished urban-dwelling individuals residing in Dhaka, Bangladesh.

Methods: A cross-sectional survey was conducted between August and September 2020 using face-to-face interviews in six disadvantaged neighborhoods (“slums”) in Dhaka. Individuals were interviewed using a semi-structured questionnaire consisting of questions assessing socio-demographics, lifestyle, financial well-being relating to the COVID-19 pandemic, depression, and PTSD.

Results: Four-hundred-and-thirty-five individuals (male = 54.7%; mean age = 45.0 ± 12.0 years; age range = 18–85 years) participated. Most (96.3%) reported that their household income decreased due to the COVID-19 pandemic. Factors associated with decreased household incomes included female gender, primary education, joblessness, food scarcity and depression. Depression symptoms were linked to female gender, joblessness, divorce, living in a joint family, excessive sleep and smoking. Low incomes, excessive sleep, joblessness and food scarcity were positively associated with PTSD symptoms. In contrast, less sleep appeared protective against PTSD.

Conclusions: Public health initiatives, in particular mental health services that target stress and biocentric approaches that consider how humans interact with multiple facets of nature, should be introduced to mitigate against potential financial and psychological effects of the pandemic on impoverished urban-dwelling individuals in Bangladesh.

Keywords: COVID-19 pandemic, poverty, Bangladesh, sleep, depression, post-traumatic stress disorder

INTRODUCTION

The outbreak of the 2019 novel coronavirus (SARS-CoV-2) emerged in China at the end of 2019, and the virus rapidly spread globally (Wang et al., 2020a; Xiang et al., 2020). COVID-19 is considered a new public health crisis and on March 11, 2020, a pandemic was declared by the World Health Organization (WHO) (Cucinotta and Vanelli, 2020). In Bangladesh, the first case of COVID-19 was officially recorded on March 8, 2020 (Banik et al., 2020a; Ferdous et al., 2020). Since then, the total number of confirmed cases has increased swiftly: ~404,760 cases had been confirmed with a death toll of 5,886 as of October 30, 2020 (Institute of Epidemiology Disease Control and Research, 2020). To deal with the pandemic, the governments of most countries have taken unprecedented preventative measures, including nationwide lockdowns, spatial distancing, business and work limitations and other actions (Anderson et al., 2020; Brooks et al., 2020).

In order to limit the spread of COVID-19, the government of Bangladesh declared nationwide restrictions on public activities and movement across the country in March, 2020 (Rahman et al., 2020a; The Daily Star, 2020; Islam et al., 2021a). While these pandemic-related constraints were critical for preventing COVID-19, they also negatively impacted occupational opportunities, increased insecurity and generated financial challenges (Bhuiyan et al., 2020; Galicki, 2020). Pandemic issues such as spatial distancing, isolation, and quarantine, as well as social and economic consequences, have led to anger, boredom, fear, frustration, grief, depression, fear, grief, posttraumatic stress disorder (PTSD), shame, and stress (Brooks et al., 2020; Islam et al., 2020d,f; Tasnim et al., 2021). These constitute common mental health problems that many individuals have been experiencing during the pandemic, and these may continue after the crisis (Banerjee, 2020). Experiencing or witnessing suffering related to COVID-19 may lead to PTSD among survivors, their families, frontline workers, and the general public (Xiao et al., 2020). The COVID-19 pandemic has impacted mental wellbeing disproportionately among specific groups including adolescents, students, women, and healthcare workers, among others (Biviá-Roig et al., 2020; Commodari and La Rosa, 2020; Wang and Zhao, 2020; Tasnim et al., 2021). Moreover, increases in drinking behaviors, problematic use of smartphone, internet, social media, gaming, and other addictive behaviors have been reported during the pandemic (Higuchi et al., 2020; Islam et al., 2020e, 2021e; Rodriguez et al., 2020; La Rosa et al., 2021). These addictive behaviors may be linked to pandemic-related traumatic events (e.g., lockdowns) and have been associated with mental health concerns including anxiety

and depression (Higuchi et al., 2020; Rodriguez et al., 2020; Islam et al., 2021e; La Rosa et al., 2021).

The pandemic that spread worldwide in 2020 has detrimentally impacted both human health and the environment (De Vido, 2020). It has been suggested that COVID-19 emerged as a result of humans living in an anthropocentric manner, with humans at the top of the hierarchy. To address current challenges, alternate approaches (e.g., biocentric rather than anthropocentric) to city planning and growth are important to consider in response to and recovery from COVID-19 (de Leeuw, 2020). Stueck (2021) concluded that six biocentric fields of action are needed to maintain humans' relations to themselves, other people, and other living beings in nature during and after pandemics: (i) maintaining effective communication, (ii) maintaining lively corporeality, (iii) interacting with one's own identity and inner-centered self-reflection in collaboration with others, (iv) building life sense and expressing life potentials, (v) expanding consciousness and perceptions of wholeness, (vi) growing ecological understanding and sustainable biocentric lifestyles and attitudes (Stueck, 2021). Such models include considering how people interact with themselves, others and organisms within environments, including cities, and more rural areas. Among groups who may be disproportionately affected by COVID-19 are people living in cities, particularly cities that have faced considerable inequities (de Leeuw, 2020).

The COVID-19 pandemic has impacted individuals globally, and especially impoverished urban-dwelling individuals living within congested environments and with limited resources. Living in such settings may lead to increased transmissibility of the virus and stress. Currently, Dhaka (where the present study was conducted), the capital city of Bangladesh, has more than 3,300 disadvantaged neighborhoods ("slums") that house around 646,000 people; of these, most are poor day laborers and rickshaw drivers (The Daily Star, 2019; Kamruzzaman, 2020). These blighted areas are densely populated; ~75% of households live in one room [Bangladesh Bureau of Statistics (BBS) and UNICEF Bangladesh, 2014]. In these areas of Bangladesh, population density is very high, estimated at 205,415 individuals/km² (United Nations, 2015; Islam and Kibria, 2020). About 37% of disadvantaged households in urban areas have 26–50 square feet per person [Centre for Urban Studies (CUS) et al., 2006]. In such circumstances, the impoverished urban residents in Dhaka often find themselves in particularly vulnerable conditions (Banik et al., 2020b), in part relating to low levels of income and high levels of financial uncertainty (Bhuiyan et al., 2020). Indeed, a recent report indicated extreme economic fallout due to the COVID-19 crisis among impoverished urban residents in Bangladesh with a reduction in per capita income by 82% from 108 Bangladeshi

Taka (BDT) (US\$1.30) in February, 2020, to 27 BDT (US\$0.32) during the survey week in early April, 2020 (Kamruzzaman, 2020). Therefore, these individuals may be particularly vulnerable to psychological concerns due to extreme levels of financial insecurity exacerbated by the COVID-19 pandemic. A recent study suggested that the most vulnerable and poorest groups in Bangladesh would likely experience socioeconomic crises and substantial mental stress due to the COVID-19 pandemic (Bodrud-Doza et al., 2020; Shammi et al., 2020). Evidence from previous studies also found that the overall negative impact of COVID-19 on the economy, daily life and social activity was associated with greater psychological difficulties (Cao et al., 2020; Zhang and Ma, 2020). Many studies from Bangladesh and China during the initial phases of the COVID-19 pandemic revealed associations between COVID-19-related experiences and anxiety, depression, and posttraumatic stress (Boyras and Legros, 2020; Cao et al., 2020; Islam et al., 2020f; Liang et al., 2020; Wang et al., 2020b; Zhang and Ma, 2020). Earlier studies conducted in Bangladesh during the COVID-19 pandemic reported that depression was associated with female gender, older age, married status, lower education, large family size (≥ 5 members), lower family income, urban residence, tobacco smoking, and sleep disturbances (Islam et al., 2020f, 2021b,f; Tasnim et al., 2021), while stress or PTSD was associated with female gender, older age, urban residence, tobacco smoking, and sleep disturbances (Islam et al., 2020f; Zubayer et al., 2020; Sultana et al., 2021).

Studies of general (community-dwelling) people, university students, medical students, healthcare workers and COVID-19 survivors have highlighted various mental health problems in Bangladesh during the pandemic [for instance, anxiety, depression, panic, stress, suicidal ideation, and behavioral problems (like problematic use of smartphone, internet, social media)] (Banna et al., 2020; Islam et al., 2020b,c,e,f, 2021b,c,e; Tasnim et al., 2020, 2021; Safa et al., 2021). However, impoverished urban residents have not been adequately studied. Thus, there is an urgent need to understand the possible psychological issues that are faced by impoverished urban residents during this pandemic. However, to the best of our knowledge, no prior study has investigated psychological measures during the COVID-19 pandemic using any standard psychometric tools among impoverished urban residents in Bangladesh. Consequently, the current study aimed to explore the associated factors of financial poverty and symptoms of depression and PTSD during the COVID-19 outbreak among impoverished urban residents of Dhaka, Bangladesh.

MATERIALS AND METHODS

Study Design and Setting

The present study used a cross-sectional and interview-based survey of impoverished urban residents in Dhaka. The survey was conducted using a structured questionnaire between August and September 2020. The survey included 6 disadvantaged neighborhoods (Aziz Shaheber Bosti Bari, Balur Maath Songlongno Bosti, Fighter Bosti, Khurshid Bari Bosti, Pinur Bosti, and Shorgochera Bosti) located in Dhaka, Bangladesh.

Study Procedure

All procedures of the present study were conducted in accordance with ethical principles of human investigations (i.e., Helsinki Declaration) and with the guideline of Institutional research ethics. After obtaining the formal ethics approval and the necessary coordination of the ethical review board of Jahangirnagar University [Ref. No: BBEC, JU/ M 2020/COVID-19/(8)5], the present study was initiated. A Bangla questionnaire incorporating informed consent and including questions and measures was employed to conduct face-to-face interviews to gather information from participants while maintaining proper precautions and spatial distancing during the COVID-19 pandemic. Considering the health risks associated with COVID-19, precautionary safety measures were taken during data collection. Participants were informed about the procedures and purpose of the study, and the confidentiality of information they provided. All data were collected anonymously and analyzed using a pre-determined coding system.

Sampling Method

The sample size was calculated using the following equation:

$$n = \frac{z^2 pq}{d^2};$$

$$n = \frac{1.96^2 \times 0.5 \times (1 - 0.5)}{0.05^2}$$

$$= 384.16 \approx 384$$

Here,

n = number of samples
 z = 1.96 (95% confidence level)

p = prevalence estimate (0.5)

q = (1- p)

d = precision limit or proportion of sampling error (0.05)

There is no prior similar study focusing on the study group during the COVID-19 pandemic. Thus, we hypothesized that psychological problems would be $\sim 50\%$ among impoverished urban residents during the pandemic. Assuming a 10% non-response rate, a total of $423.5 \approx 424$ participants was estimated. However, 435 participants were recruited to ensure adequate power for the study (see **Figure 1**).

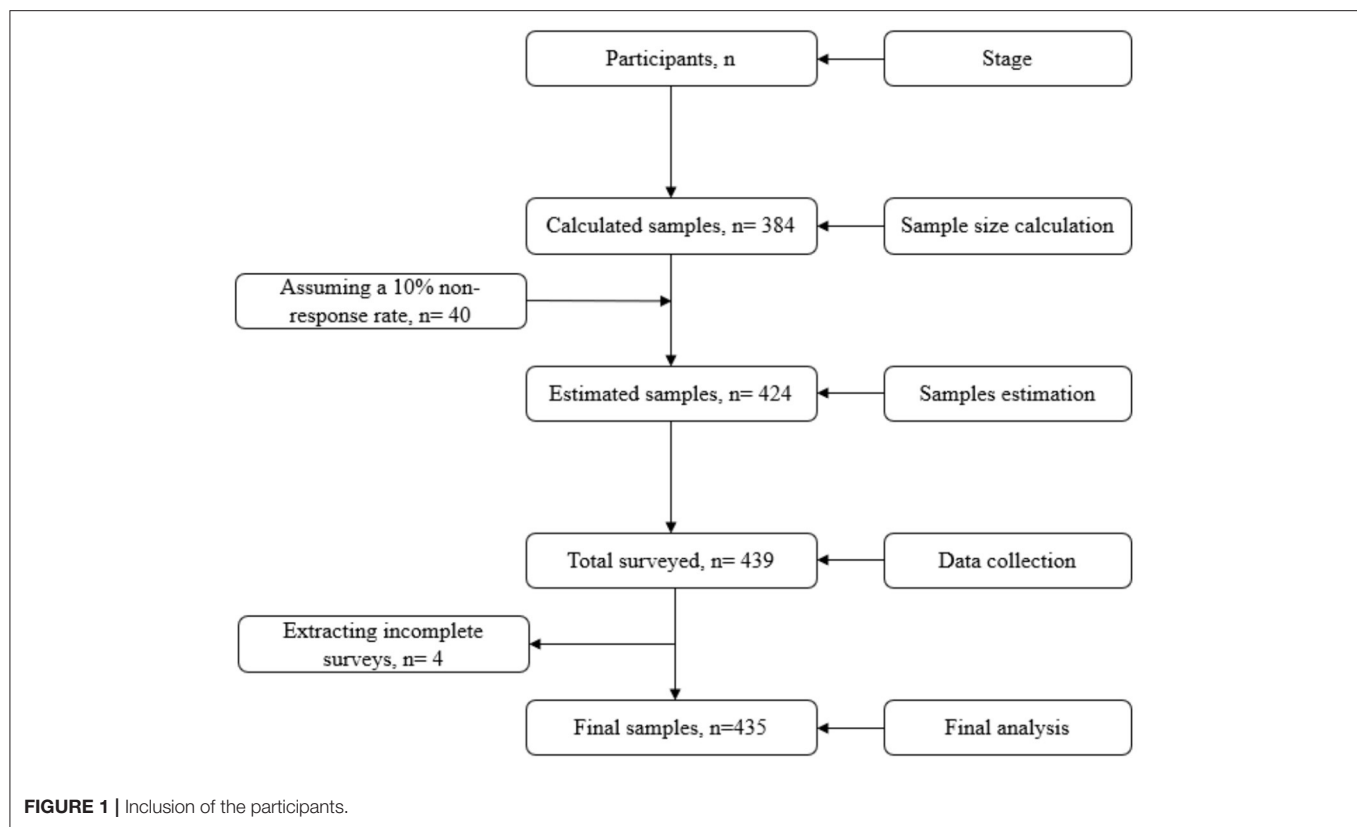
The inclusion criteria for participants were (1) being aged ≥ 18 years, (2) being impoverished urban residents, and (3) willingness to enroll in the survey. Exclusion criteria were (4) being < 18 years old, (5) not being able to provide consent, and (6) having incomplete surveys. After obtaining informed consent, 439 participants were interviewed using a convenience sampling approach. At the data quality checking stage, 4 participants with incomplete surveys were removed, and 435 participants were included in the final analysis.

Measures

The questionnaire included informed consent and questions assessing socio-demographic, lifestyle, financial and COVID-19-related domains, and depression and PTSD.

Socio-Demographics and Lifestyle-Related Measures

Data were collected on gender (male/female), age, marital status (unmarried/married/divorced or widowed), education (no



formal education, primary level [1-5 grades], and secondary level [6–10 grades] or greater), occupation, family type (nuclear/joint), and monthly family income. Age was subsequently categorized into two groups: 18–40 years and > 40 years; and monthly family income was categorized into two groups: ≤ 10,000 BDT and > 10,000 BDT.

In addition, numbers of average sleep hours and smoking status were assessed. Average hours of sleep were classified as normal (7–9 h), less than normal (< 7h), or more than normal (> 9h) based on previous reports (Hirshkowitz et al., 2015; Chen et al., 2020; Islam et al., 2020a).

Financial Measures

The financial impact of COVID-19 was assessed by asking, “How has your family’s monthly income changed due to the impact of COVID-19?” There were three possible responses (i) decreased; (ii) increased; (iii) unchanged, as previously reported (Tran et al., 2020). As no participants reported their income “increased” due to the impact of the COVID-19 pandemic, decreased or unchanged incomes were ultimately categorized. Two additional “yes/no” questions were asked during the survey concerning familial job loss and food scarcity due to COVID-19.

Patient Health Questionnaire (PHQ-9)

The PHQ-9 is a unidimensional psychometric instrument developed by Spitzer et al. (1999) for assessing depressive disorder. It is a psychometrically sound and robust screening tool used globally in epidemiological surveys. The scale contains

nine questions querying about depressive symptoms over the past 2 weeks (e.g., “Trouble falling or staying asleep, or sleeping too much”). Responses were assessed with a four-point Likert scale ranging from 0 (*Not at all*) to 3 (*Nearly every day*). The present study utilized the Bangla version of the PHQ-9 (Chowdhury et al., 2004) to assess participants’ depressive symptomatology as previously in Bangladeshi samples (Islam et al., 2020b, 2021d; Moonajilin et al., 2020; Rahman et al., 2020b). The total score ranged from 0 to 27, with higher scores reflecting greater severity. In the present study, the reliability coefficient Cronbach’s α of the PHQ-9 scale was 0.83.

National Stressful Events Survey for PTSD-Short Scale (NSESSS-PTSD)

The NSESSS-PTSD is a brief, easy to use, psychometrically sound and robust instrument for assessing PTSD, developed by LeBeau et al. (2014) and based on DSM-5 diagnostic criteria. This scale consists of nine-item questions regarding problems related to PTSD symptoms over the last week (i.e., “Feeling very emotionally upset when something reminded you of a stressful experience”) with a five-point Likert scale ranging from 0 (*Not at all*) to 4 (*Extremely*). The present study used the Bangla version of the NSESSS-PTSD to assess participants’ PTSD. The NSESSS-PTSD was translated following back translation, the most widely used standardized translation, as proposed by Beaton et al. (2000). The total score ranged from 0 to 36, with higher scores reflecting more severe PTSD. In the present study, the internal consistency

for the NSESSS-PTSD (Cronbach's $\alpha = 0.70$) was acceptable (Taber, 2018).

Statistical Analyses

Analyses were performed using three statistical software packages (Microsoft Excel 2019, IBM SPSS Statistics version 25, and STATA version 13). Microsoft Excel was used to perform data cleaning, coding, editing and sorting. Then an excel file including all variables was imported into SPSS software. For categorical variables, frequencies and percentages were reported; means and standard deviations were presented for continuous data. In addition, some first-order analyses (e.g., Chi-square tests, Fisher's exact tests) were performed using SPSS. Finally, the multiple linear regression model was investigated using STATA to determine the associated factors of depression and PTSD symptomatology. A p -value ≤ 0.05 was considered as statistically significant.

RESULTS

General Characteristics

Participants ($n = 435$) had a mean age of 45.0 years ($SD = 12$), and ages ranged from 18 to 85 years. Of participants, 54.7% were male and most were married (87.4%; see **Table 1**). Most participants had a primary level of education (grades 1–5; 74.3%), had monthly family income $\leq 10,000$ BDT (55.9%), and belonged to a nuclear family (89.0%; **Table 1**). Many indicated that they kept small shops (24.8%). Most reported that they slept in a normal range (7–9 h/day; 66.7%), and a sizeable minority smoked cigarettes (23.2%). A vast majority reported that they had lost their jobs due to the impact of the COVID-19 pandemic (95.6%). Likewise, 98.9% reported they had suffered from food scarcity due to the COVID-19 pandemic.

Financial Concerns and Their Correlates

Most participants reported their household income was decreased due to the impact of COVID-19 (96.3%). Household income decreases due to the impact of COVID-19 were related to (i) being female vs. male (98.5 vs. 94.5%, $p = 0.039$), (ii) having had primary vs. no formal education (97.8 vs. 91.1%, $p = 0.010$), (iii) having had lost jobs vs. not (97.0 vs. 40.0%, $p < 0.001$), (iv) having had experienced food scarcity due to COVID-19 vs. not (97.4 vs. 73.7%, $p < 0.001$), and (v) having higher vs. lower depression scores (7.2 ± 4.4 vs. 5.0 ± 5.0 , $p = 0.05$).

Associations With Depression and PTSD

The mean scores of depression and PTSD were 7.1 ± 4.4 (out of 27) and 15.1 ± 3.4 (out of 36), respectively. Features related to depression and PTSD are presented in **Figure 2**. Of note, depression and PTSD were significantly and positively correlated with each other (Pearson $r = 0.34$; $p < 0.001$).

Table 2 summarizes a multiple regression analysis statistically predicting depression and PTSD. In Model 1, all examined variables were entered together to examine associations with depression symptoms. Higher depression scores were positively

associated with female gender ($\beta = 0.19$; $p = 0.035$), joblessness ($\beta = 0.11$; $p = 0.043$), being divorced ($\beta = 0.20$; $p < 0.001$), living in joint family ($\beta = 0.13$; $p = 0.01$), excessive sleep (>9 /day) ($\beta = 0.09$; $p = 0.045$), and smoking ($\beta = 0.14$; $p = 0.008$). The regression Model 1 predicted 17% of the variance in depression scores ($F_{(20, 414)} = 5.53$, $p < 0.001$).

Next, all measures were entered together to examine associations with PTSD symptoms in Model 2. Higher PTSD scores were positively associated with monthly incomes $\leq 10,000$ BDT ($\beta = 0.17$; $p = 0.004$), excessive sleep (>9 h/day) ($\beta = 0.11$; $p = 0.023$), joblessness due to the COVID-19 pandemic ($\beta = 0.13$; $p = 0.010$), and experiencing food scarcity due to the COVID-19 pandemic ($\beta = 0.14$; $p = 0.007$); and less sleep (<7 h/day) was negatively associated with PTSD scores ($\beta = -0.11$; $p = 0.017$). The regression Model 2 predicted 10% of the variance in PTSD scores ($F_{(20, 414)} = 3.33$, $p < 0.001$).

DISCUSSION

The COVID-19 pandemic has exerted psychological and financial impacts on many people (Banna et al., 2020; Bodrud-Doza et al., 2020; Islam et al., 2020c; Zubayer et al., 2020). Among urban-dwelling individuals worldwide, the pandemic has particularly impacted impoverished residents compared to others, especially those living in low- and middle-income countries (Tampe, 2020). The present study investigated financial hardships and, the symptoms of depression and PTSD symptoms among impoverished urban residents in Dhaka, Bangladesh during the COVID-19 pandemic. Notably, the vast majority of individuals ($> 95\%$) experienced decreased household incomes, job losses and food insecurity during the COVID-19 pandemic. These stress-eliciting experiences suggest that biocentric strategies that target stress and increase coping (e.g., mindfulness-based stress reduction) coupled with changing environmental contexts (e.g., addressing crowded living situations and poverty) are needed to improve the health of impoverished inhabitants of Dhaka. As there have been no prior studies in Bangladesh investigating financial hardships along with mental health among this marginalized group, the present findings have been placed in the context of findings from prior studies undertaken in different regions and involving different populations.

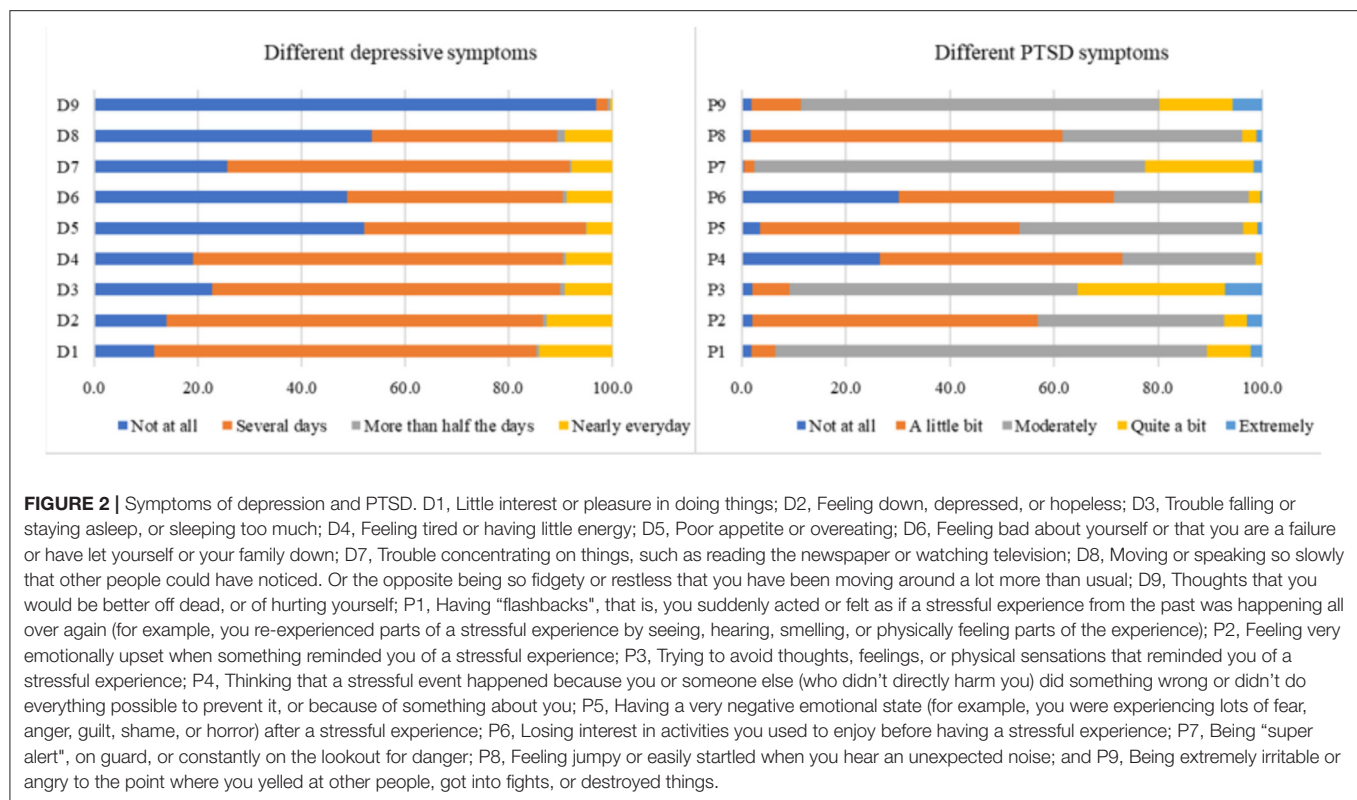
The COVID-19 pandemic has had a major impact on the country's economy and on individuals, apart from its impacts on the national health situation (Bodrud-Doza et al., 2020). Due to the current pandemic, many individuals or families have lost their sources of income (The World Bank, 2020). In the present study, 96.3% of respondents reported a decrease in their household income due to the impact of the COVID-19 pandemic. This percentage is higher than those in Vietnam (66.9%) (Tran et al., 2020) and India (45.6%) (Keelery, 2020). The disparity could be attributable to differences in economic structures and major markets between countries. The economy of Bangladesh has heavily relied on ready-made garments and foreign remittance,

TABLE 1 | Measures and their associations with household income decreases due to the impact of COVID-19.

Characteristics	Household income changes due to COVID-19				Total		χ^2	df	p-value
	Yes		No						
	n	(%)	n	(%)	n	(%)			
Total	419	(96.3)	16	(3.7)	435	(100)			
Gender									
Male	225	(94.5)	13	(5.5)	238	(54.7)	4.72*	1	0.039
Female	194	(98.5)	3	(1.5)	197	(45.3)			
Education									
No formal education	51	(91.1)	5	(8.9)	56	(12.9)	8.12*	2	0.010
Primary level (1–5 grades)	316	(97.8)	7	(2.2)	323	(74.3)			
Secondary level (6–10 grades)	52	(92.9)	4	(7.1)	56	(12.9)			
Occupation									
Housewife	53	(100.0)	0	(0)	53	(12.2)	9.45*	6	0.087
Workers	94	(96.9)	3	(3.1)	97	(22.3)			
Day laborer	24	(92.3)	2	(7.7)	26	(6.0)			
Rickshaw puller	92	(96.8)	3	(3.2)	95	(21.8)			
Jobless	25	(96.2)	1	(3.8)	26	(6.0)			
Small shop keeping	105	(97.2)	3	(2.8)	108	(24.8)			
Others	26	(86.7)	4	(13.3)	30	(6.9)			
Marital status									
Married	367	(96.6)	13	(3.4)	380	(87.4)	2.57*	2	0.277
Unmarried	18	(90.0)	2	(10.0)	20	(4.6)			
Divorced	34	(97.1)	1	(2.9)	35	(8.0)			
Family type									
Nuclear	373	(96.4)	14	(3.6)	387	(89.0)	0.04*	1	0.693
Joint	46	(95.8)	2	(4.2)	48	(11.0)			
Monthly family income									
≤10,000 BDT	234	(96.3)	9	(3.7)	243	(55.9)	0.01	1	0.975
>10,000 BDT	185	(96.4)	7	(3.6)	192	(44.1)			
Sleep status									
<7 h	136	(97.8)	3	(2.2)	139	(32.0)	3.99*	2	0.135
7–9 h	278	(95.9)	12	(4.1)	290	(66.7)			
>9 h	5	(83.3)	1	(16.7)	6	(1.4)			
Tobacco smoking									
Yes	99	(98.0)	2	(2.0)	101	(23.2)	1.07*	1	0.382
No	320	(95.8)	14	(4.2)	334	(76.8)			
Job loss due to COVID-19									
Yes	417	(97.0)	13	(3.0)	416	(95.6)	28.74*	1	<0.001
No	2	(40.0)	3	(60.0)	19	(4.4)			
Experiencing food scarcity due to COVID-19									
Yes	405	(97.4)	11	(2.6)	430	(98.9)	45.29	1	<0.001
No	14	(73.7)	5	(26.3)	5	(1.1)			
	Mean	(SD)	Mean	(SD)	Mean	(SD)	t	df	p-value
Age	44.9	(11.9)	45.7	(14.0)	45.0	12.0	0.06	1	0.803
Depression	7.2	(4.4)	5.0	(5.0)	7.1	(4.4)	3.86	1	0.050
PTSD	15.2	(3.2)	13.7	(7.2)	15.1	(3.4)	3.06	1	0.081

SD, Standard deviation; BDT, Bangladeshi Taka.

*Fisher's Exact test.



both impacted substantially by the COVID-19 pandemic (Amit, 2020). In this study, the decreased household income was associated with being female, having a primary education level, having lost jobs, having experienced food scarcity and having experienced more symptoms of depression. Household income is reduced more among females than males due to the impact of the COVID-19 pandemic resonates with prior findings (Rudkin, 1993). A primary education level was associated with decreased household income during the COVID-19 pandemic, possibly owing to these individuals being in unskilled and “disposable” employment. In addition, decreased household income during the COVID-19 pandemic was linked to job losses, food scarcity and depression. Several of these factors may relate to periods of lockdown or closure of businesses following the requirement of strict spatial distancing in Bangladesh, and longer-term and longitudinal studies to investigate this possibility are needed.

In the present study, the regression analysis exhibited that being female, experiencing joblessness, being divorced, living in a joint family, sleeping excessively (>9 h/day), and smoking were associated with higher depression scores. The finding of women reported higher depression scores than men is consistent with previous reports (Van Droogenbroeck et al., 2018; Hossain et al., 2019; Islam et al., 2020f). Females may experience increased emotional vulnerability and suffer more from stressors related to negative psychological effects, such as the death of friends or family, and these factors may hold relevance during a

pandemic (Matheson et al., 2014; Van Droogenbroeck et al., 2018).

Participants with joblessness attributable to the COVID-19 pandemic experienced more depression, consistent with prior studies (Mandal et al., 2011; Stolove et al., 2017). The COVID-19 pandemic has generated job loss/displacement, resulting in decreased incomes (Tran et al., 2020), and these events may contribute to depression.

Being divorced was associated with depression in the present study, consistent with previous reports (Sbarra et al., 2014). This association may reflect loneliness, isolation, and other social problems that may be experienced in a more solitary fashion when divorced and may be particularly impactful during the pandemic (Saltzman et al., 2020). The present study also observed an association between depression and living in joint families, in line with prior findings (Mishra et al., 2018); however, the finding is distinct from those in a prior Bangladeshi study (Islam et al., 2020f) reporting no relationship between family type and depression. In contrast, prior data have linked residing in nuclear families to depression (Taqui et al., 2007). These differences may reflect certain circumstances relating to impoverished living settings during a pandemic that speculatively may include financial hardships related to greater monthly household costs, job displacements, food scarcity or other factors. These considerations warrant further investigation.

Excessive sleep (>9 h/day) was associated with depression. This finding aligns with a prior Bangladeshi longitudinal study (Hossain et al., 2019) and reviewed findings (Lovato and Gradisar, 2014) but appears to contrast with prior Bangladeshi reports (Anjum et al., 2019; Islam et al., 2020a) that observed no association between sleeping hours and depression. The extent to which the findings might relate to longer sleep of poorer quality given crowded living situations or other factors warrants additional study. The present findings also linked smoking to depression, consistent with prior reports in Bangladesh (Islam et al., 2020f, 2021d; Tasnim et al., 2021), global findings from 48 low- and middle-income countries (Stubbs et al., 2018) and a systematic review (Fluharty et al., 2017).

In regression analyses, higher PTSD scores were associated with monthly incomes $\leq 10,000$ BDT, excessive sleep (>9 h/day), job loss due to the COVID-19 pandemic and food scarcity due to the COVID-19 pandemic. This study revealed no gender-related difference relating to PTSD symptoms, which differs from a recent study from China during the COVID-19 pandemic that reported higher PTSD symptomatology among females compared to males (Liu et al., 2020). The extent to which this difference may reflect cultural differences or distinct populations warrants additional study.

Lower income ($\leq 10,000$ BDT $\approx \leq 118$ US\$ per month) and sleep disturbances (increased) were associated with more severe PTSD symptomatology, in line with previous reports (Maher et al., 2006; Parto et al., 2011). A scoping review also concluded that individuals who suffer from PTSD have sleep disturbances (Magnavita and Garbarino, 2017). The seemingly protective effect of less sleep warrants further investigation.

The present study also indicated that job loss and food insecurity due to the COVID-19 pandemic were associated with more severe PTSD symptomatology. Spatial distancing and lockdown measures in conjunction with living in close quarters are factors that speculatively may generate PTSD symptoms. Other factors, including disruptions to everyday life and routines, financial hardships, job losses, and diminished social support, may also contribute to PTSD symptoms (Boyras and Legros, 2020; Islam et al., 2020d). Low-income communities may be at particular risk of developing PTSD as impoverished urban residents may experience more trauma than some other groups living in more well-developed areas (Boyras and Legros, 2020). A dense population, congested living accommodations and lower incomes warrant consideration in the development and addressing of PTSD symptomatology. PTSD develops when symptoms from a psychological trauma disrupt daily functioning and last for over a month. PTSD symptoms may persist for decades if not treated (Bo et al., 2020). Therefore, the present study suggests the need for effective interventions, including outreach efforts, psychopharmacological treatments and behavioral therapies (including mind-body interventions), and addressing of traumatic living situations and life experiences (Horesh and Brown, 2020).

Of note, the largely anthropocentric measures collected and modeled in the current study accounted for relatively small amounts of variance in relation to mental health measures. These findings suggest that future models should consider additional factors. In this process, biocentric factors may be important to consider. The current study focused on impoverished urban-dwelling individuals in Dhaka city during the COVID-19 pandemic. Considering the pandemic from a larger focus, including with respect to how cities interact with nature and respond during emergencies like the pandemic, will be important moving forward (de Leeuw, 2020). Cities have been described as important governing bodies in responses to crises like the COVID-19 pandemic, but have long struggled with substantial inequities, including those between humans and other species. Citizens in cities have often been impacted disproportionately by disease burden, and this appears true during the COVID-19 pandemic. To address current challenges, it will be important to approach city planning using biocentric strategies in response to and when recovering from the COVID-19 pandemic. Such approaches should be grounded in models that consider biocentric relationships between people and themselves, other humans and other organisms in nature (Stueck, 2021). As other pandemics are likely to occur in the future, addressing these concerns in a timely fashion is important.

Limitations

There are some limitations that warrant discussion. This study was cross-sectional; thus, it is not possible to make causal inferences. Future longitudinal studies are needed. The findings may not generalize to other impoverished urban residents beyond Dhaka, Bangladesh. Future larger-scale studies involving other jurisdictions are warranted. The study gathered a limited number of COVID-19-related assessments. Future studies should examine additional relevant COVID-19-related domains using validated questions. Further, as decreases in household income were highly prevalent, ceiling effects may have influenced findings. Although the regression models considered a large number of variables, they captured relatively small amounts of the variances.

CONCLUSIONS

Marginalized communities like impoverished urban residents have been greatly impacted amid the COVID-19 pandemic perhaps given their dense populations, congested accommodations and low incomes. In the current study, most impoverished urban residents reported decreased household incomes due to the COVID-19 pandemic. The findings indicated that depression symptoms were associated with being female, joblessness, being divorced, living in a joint family, excessive sleep and smoking. Low incomes, excessive sleep, joblessness and food scarcity were associated with PTSD symptoms. In contrast, less sleep appeared protective against PTSD. There is a crucial need for a thorough evaluation of the effects of the COVID-19 pandemic on various groups over the next decade, which will inform the government of the need to introduce effective policies to ease the economic and psychological pain of

TABLE 2 | Multiple regression analysis predicting depression and PTSD.

Characteristics	Depression ^a							PTSD ^b					
	Mean (SD)	B	95% CI	β	SE	p-value		Mean (SD)	B	95% CI	β	SE	p-value
Gender													
Male	6.4 (4.0)			†				14.9 (3.7)			†		
Female	8.1 (4.7)	1.68	(0.12–3.25)	0.19	0.80	0.035		15.4 (3.0)	0.21	(–1.04–1.46)	0.64	0.03	0.744
Age													
18–40 years	6.6 (4.0)			†				15.1 (3.1)			†		
>40 years	7.6 (4.7)	0.50	(–0.36–1.35)	0.06	0.43	0.253		15.2 (3.6)	0.02	(–0.66–0.70)	0.35	0.00	0.958
Education													
Secondary level (6–10 grades)	7.5 (4.4)			†				15.3 (3.6)			†		
No formal education	7.6 (5.9)	–0.76	(–2.36–0.85)	–0.06	0.82	0.355		15.6 (5.5)	–0.10	(–1.39–1.19)	0.66	–0.01	0.882
Primary level (1–5 grades)	7.0 (4.1)	–1.14	(–2.38–0.11)	–0.11	0.63	0.073		15.0 (2.8)	–0.50	(–1.50–0.50)	0.51	–0.06	0.326
Occupation													
Housewife	8.6 (5.3)			†				15.1 (2.8)			†		
Workers	6.9 (3.6)	–1.07	(–2.76–0.62)	–0.10	0.86	0.214		15.5 (2.9)	0.03	(–1.32–1.38)	0.69	0.00	0.969
Day laborer	6.0 (5.0)	–0.65	(–3.23–1.93)	–0.03	1.31	0.620		14.5 (6.2)	–0.63	(–2.69–1.44)	1.05	–0.04	0.552
Rickshaw puller	6.9 (3.5)	0.36	(–1.73–2.44)	0.03	1.06	0.737		15.4 (3.4)	0.85	(–0.82–2.52)	0.85	0.10	0.318
Jobless	11.3 (5.8)	2.12	(0.07–4.16)	0.11	1.04	0.043		16.2 (4.2)	0.34	(–1.30–1.98)	0.83	0.02	0.683
Small shop keeping	6.3 (4.2)	–0.18	(–2.00–1.64)	–0.02	0.92	0.845		14.8 (2.9)	0.15	(–1.31–1.60)	0.74	0.02	0.844
Others	6.4 (4.7)	–0.21	(–2.5–2.08)	–0.01	1.17	0.858		14.1 (3.3)	–0.78	(–2.62–1.05)	0.93	–0.06	0.401
Marital status													
Married	6.7 (3.9)			†				15.0 (3.4)			†		
Unmarried	6.3 (3.6)	–0.54	(–2.54–1.46)	–0.03	1.02	0.598		16.5 (4.2)	1.50	(–0.11–3.10)	0.82	0.09	0.067
Divorced	12.1 (6.9)	3.31	(1.61–5.02)	0.20	0.87	<0.001		16.1 (3.0)	0.57	(–0.80–1.93)	0.69	0.05	0.416
Family type													
Nuclear	6.7 (4.0)			†				15.0 (3.3)			†		
Joint	10.5 (6.3)	1.87	(0.45–3.29)	0.13	0.72	0.010		16.4 (4.0)	1.02	(–0.12–2.16)	0.58	0.09	0.080
Monthly family income													
>10,000 BDT	7.0 (4.5)			†				14.6 (2.9)			†		
≤10,000 BDT	7.2 (4.4)	0.74	(–0.26–1.74)	0.08	0.51	0.144		15.6 (3.7)	1.18	(0.38–1.98)	0.41	0.17	0.004
Sleep status													
7–9 h	6.9 (4.5)			†				15.4 (3.7)			†		
<7 h	7.5 (4.3)	0.73	(–0.12–1.57)	0.08	0.43	0.090		14.6 (2.7)	–0.82	(–1.49–0.15)	0.34	–0.11	0.017
>9 h	10.7 (4.6)	3.53	(0.08–6.97)	0.09	1.75	0.045		18.0 (1.9)	3.19	(0.44–5.95)	1.40	0.11	0.023
Tobacco smoking													
No	7.1 (4.6)			†				15.2 (3.5)			†		
Yes	7.3 (3.8)	1.50	(0.39–2.61)	0.14	0.56	0.008		15.0 (2.9)	0.03	(–0.86–0.92)	0.45	0.00	0.946
Job loss due to COVID-19													
No	6.5 (6.1)			†				12.6 (6.6)			†		
Yes	7.2 (4.3)	–0.23	(–2.3–1.84)	–0.01	1.05	0.829		15.3 (3.1)	2.18	(0.52–3.84)	0.84	0.13	0.010
Experiencing food scarcity due to the COVID-19 pandemic													
No	2.8 (3.0)			†				9.6 (7.3)			†		
Yes	7.2 (4.4)	1.91	(–2.06–5.88)	0.05	2.02	0.345		15.2 (3.3)	4.38	(1.20–7.56)	1.62	0.14	0.007
Household income decreases due to the COVID-19 pandemic													
No	5.0 (5.0)			†				13.7 (7.2)			†		
Yes	7.2 (4.4)	1.48	(–0.75–3.71)	0.06	1.13	0.193		15.2 (3.2)	0.36	(–1.43–2.14)	0.91	0.02	0.694

SD, Standard deviation; B, Unstandardized regression coefficient; CI, Confidence interval; SE, Standard error; β , Standardized regression coefficient; BDT, Bangladeshi Taka.

†Reference category.

^aModel summary (Depression): $F_{(20, 414)} = 5.53$, $p < 0.001$, $R^2_{Adj} = 0.17$.^bModel summary (PTSD): $F_{(20, 414)} = 3.33$, $p < 0.001$, $R^2_{Adj} = 0.10$.

vulnerable communities. Considering a biocentric perspective and strategies that consider mind-body relationships and ethical attitudes toward the environment (e.g., addressing impoverished living situations) should help promote individual and public health. Public health initiatives, in particular mental health services, should be introduced to mitigate the psychological effects of the pandemic on impoverished urban residents and other vulnerable populations.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the ethical review board of Jahangirnagar

University [Ref. No: BBEC, JU/M 2020/COVID-19/(8)5]. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

MI, ME, and SH: conceptualization and investigation. MI: methodology and formal analysis. ME: resources. SH: supervision. MI, MR, and RB: writing—original draft preparation. NS, SH, MH, MS, LS, and MP: writing—review and editing. MP: critical revision. All authors have read and approved the final manuscript.

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The Consequences of COVID-19 Toward Human Growth: The Role of Traumatic Event and Coping Strategies Among Indonesian Sample

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COVID-19 has brought a massive psychological impact on individuals' life. The current study sets a significant purpose to test the model whether post-traumatic stress and coping strategies affect stress-related growth regarding the COVID-19 event. One hundred and ninety-nine participants have participated in an online survey in the period of lockdown. The proposed hypotheses model is further tested using PLS-SEM. The first model explains a significant moderate, 46% amount of variance for stress-related growth. With gender as moderator, the second model explains a significant 29% amount of variance for stress-related growth, which is also moderate. This study shows that active coping strategies and positive affirmation significantly influence individual stress-related growth. The trauma event (COVID-19) does not significantly affect growth. Women experience trauma compared to men, besides active coping with the COVID-19 situation is higher in men than women. Using the Bio-centric perspective, having a positive connection through acceptance and awareness of the situation, self-care, and affective interaction with others would develop growth regarding traumatic situations. Further, interventions about coping skills and positive affirmations are essential to give, especially to vulnerable groups such as women.

Keywords: human growth, traumatic event, coping strategies, COVID-19, Indonesian

INTRODUCTION

COVID-19 cases were reported for the first time in December 2019 in Wuhan, China (Wang et al., 2020). Since then, cases have increased every day and peaked in late January to early February 2020 (World Health Organization, 2020a). On March 11, 2020, the World Health Organization (WHO) officially announced the Covid-19 outbreak as a global pandemic, after 118,000 confirmed cases and 4,291 reported deaths occurred in 114 countries (World Health Organization, 2020a,b). An increase in the number of cases also occurred in Indonesia. Starting from July 28, 2019, Indonesia's COVID cases reached 102,051 people identified as having positive COVID-19, 60,539 of them recovered, and 4,901 died (Gugus Tugas Penanganan COVID-19 [Task Force for the Acceleration of Handling COVID-19], 2020). Ranks first in the highest confirmed cases of contracting countries in Southeast Asia, followed by the Philippines with

63,001 cases (Kementrian Kesehatan Republik Indonesia [Ministry of the Republic of Indonesia], 2020). Based on official data presented on the Ministry of Health website on July 19, 2020, the number of positive confirmed cases has reached 13,876,441 with 593,087 deaths (4.3%), and the number of countries affected as many as 215 countries. Meanwhile, the number of positive confirmed cases in Indonesia has reached 84,882 cases, with a total of 4,016 deaths, so the percentage of fatalities is 4.7%. Indonesia ranks first in the highest confirmed cases of contracting countries in Southeast Asia, followed by the Philippines with 63,001 cases (Kementrian Kesehatan Republik Indonesia [Ministry of the Republic of Indonesia], 2020).

The disease is spreading rapidly throughout the world due to the unique nature of the COVID-19 virus, genetic diversity, highly contagious, easy to apply, and relatively unaffected by climate variations (Mackenzie and Smith, 2020). The increasing number of cases occurred very significantly globally, reaching 16,301,736 with a mortality rate of 650,069 in 216 countries in July 2020 (World Health Organization, 2020b). An increasing number of cases also occur in Indonesia. As of July 28, 2020, COVID-19 cases in Indonesia reached 102,051 people who were positively identified as having COVID, 60,539 of them recovered, and 4,901 died (Gugus Tugas Penanganan COVID-19 [Task Force for the Acceleration of Handling COVID-19], 2020). Problems arising from the presence of COVID-19 have various psychological impacts on society. Banerjee (2020) mentioned several mental health challenges experienced by the community, including panic, phobia, anxiety, sleep disorders, and dissociative symptoms.

As the number of positive confirmed cases and death rates related to COVID-19 increases, their effects on individuals and society's psychological and economic conditions also increase (Boyraz and Legros, 2020). Psychologically, the pandemic condition is scientifically proven to cause anxiety disorders, post-traumatic stress disorder, as well as to bring about depression (Bo et al., 2020; Boyraz and Legros, 2020; Ho et al., 2020; Li et al., 2020; Liu et al., 2020; Qiu et al., 2020; Shigemura et al., 2020; Wang et al., 2020). Surveys conducted weekly by the City University of New York (CUNY) since March 13, 2020, indicate that many New Yorkers experience a variety of anxiety-related to pandemics such as infected anxiety, social isolation, job loss, inability to pay bills, and so on. Most are also related to post-traumatic stress and other mental health disorders (CUNY Graduate School of Public Health and Health Policy, 2020).

Another study conducted in China involving 1,210 respondents from 194 cities showed that 16.5% of respondents reported experiencing depressive syndrome at moderate to severe levels. Meanwhile, 28.8% experienced levels of anxiety symptoms at moderate to intense levels. At the same time, 8.1% of respondents indicated that stress levels were average to severe. Based on this research, respondents of the female sex, respondents with student status, and respondents with certain physical symptoms and low health levels show higher stress levels, anxiety, and depression (Wang et al., 2020). In line with these results, research conducted on 1,115 respondents in Turkey also showed the effects that COVID-19 influenced psychological conditions, including feelings of depression, loneliness, fear

of death, lack of hope, sadness, anxiety about the future, and feelings of worthlessness (Ustun, 2020).

Traumatic events can impact individual lives, such as stress levels that affect daily life (Ponnamperuma and Nicolson, 2018). The accumulation of stress levels, in the long run, will have an impact on mental health problems and the functioning of the individual. In adolescents, traumatic events impact the emergence of fear and worry about getting the label "abnormal" or different from their peers. Exposure to trauma experienced by adolescents can affect the environment's withdrawal to encourage the emergence of destructive behaviors (National Child Traumatic Stress Network, 2010). Not only that, while growing up, traumatic events can also have an impact on the process of forming self-identity (Waterman, 2020). For example, obstacles experienced by individuals in decision making. Individuals who have experienced trauma may consider or postpone the decision so that this process hinders the formation of the individual's self-identity.

Pandemic has been proven to have a traumatic effect on humans. Fear of death for both self and family is one of the reasons for the emergence of trauma in individuals during the pandemic (Murphy and Moret-Tatay, 2021; Pérez-Mengual et al., 2021). In addition, the lockdown policy creates its own stressor due to limited social activities (Burrai et al., 2020; Roma et al., 2020).

The result can be different in each individual, influenced by several factors such as age (Bonanno, 2004; Lee et al., 2007; Yip et al., 2010; Jiang et al., 2020), gender (Mak et al., 2010; Lai et al., 2020; Sun et al., 2020), as well as the presence of risk factors and protective factors (Boyraz and Legros, 2020).

Gender influences individual coping strategies (Mohiyeddini et al., 2013). Gender differences between men and women show different reactivity and responses in dealing with stressors (Verma et al., 2011). Research conducted by Deng et al. (2016) shows that men more often have intense emotional experiences while women have stronger emotional expressivity. Although men experience intense emotions, gender stereotypes allow them not to express themselves honestly (Deng et al., 2016).

Although traumatic events often harm individuals, many studies have shown that traumatic events can also broaden one's perspective, improve their ability to overcome problems, develop personal and social skills. Some changes that occur after these stressful events are often referred to as stress-related growth (Park and Fenster, 2004; Kesimci et al., 2005; Amaral et al., 2013; Macdonald, 2019). After a person experiences stress, the change that occurs is a resilient response (Zautra and Reich, 2011). The mechanism by which a person can grow after facing a stressful situation is often explained by a cognitive coping approach (Park and Fenster, 2004), where individuals can attempt to analyze the positive meaning of stressful events experienced (Solcova and Tavel, 2017). Furthermore, Stueck (2021) stated that moral priority should be given to the survival of individual living beings on pandemic based on the biocentric health management approach. There are six biocentric fields of action during and after pandemics to overcome resilient response and to protect the connection of humans namely maintenance affective communication, maintenance of lively corporeality, contact with

one's own identity and inner oriented self-reflexion together with others, construction of life sense and expression of life potentials, expansion of consciousness and perception of the wholeness, and development of ecological awareness and sustainable biocentric lifestyles and attitudes (Stueck, 2021).

In addition, various literatures have tried to develop various strategies for dealing with traumatic events during a pandemic. Ramkissoon (2020) exploring the interplay of relationships between place confinement, pro-social behavior, household pro-environmental behaviors, place attachment as a multi-dimensional construct and presenting their relationships to residents' wellbeing. Further, Majeed and Ramkissoon (2020) developed and propose a conceptual framework related perceived goodness of therapeutic landscapes, health and wellness consumption, place attachment, and re-visitation. In addition, Ramkissoon (2021) discusses COVID-19 place confinement as a context to deliver body-mind medicine interventions including psycho-social, psycho-educational, relaxation, and meditation.

The current study sets a significant purpose to test the model whether post-traumatic stress and coping strategies affect stress-related growth regarding the COVID-19 event. Specifically, the study posed the following hypothesis:

1. Post-traumatic stress has a negative and significant effect on stress-related growth
2. Coping strategies have a positive and significant effect on stress-related growth
 - a. Depressive strategies have a negative and significant effect on stress-related growth
 - b. Active coping strategies have a positive and significant effect on stress-related growth
 - c. Self-construction strategies have a positive and significant effect on stress-related growth
 - d. Religiosity and search for meaning strategies have a positive and significant effect on stress-related growth
 - e. Wishful thinking strategies have a negative and significant effect on stress-related growth
3. Gender moderates the relationship between post-traumatic stress, and stress-related growth
4. Gender moderates the relationship coping strategies, and stress-related growth

MATERIALS AND METHODS

The Current Study

The current study aimed to test the model of whether post-traumatic stress and coping strategies affect stress-related growth regarding the COVID-19 event. Specifically, gender moderates the relationship between post-traumatic stress, and stress-related growth. We expect post-traumatic stress experienced by individuals is determined by gender in generating stress-related growth. Variations in individual post-traumatic stress levels are determined by gender which then affects their stress-related growth. We hope that the study can provide significant information about the role of traumatic

events and coping strategies to overcome the psychological impact of COVID-19 and promote human growth through a comprehensive bio-centric approach.

Participants

We collected online questionnaires administered through an online platform with google form during the third week of the COVID-19 and stay-at-home guidance in Indonesia. One hundred nineteen participants were given research information sheets and informed consent to be signed before filling out the questionnaire. Each participant could not fill out the questionnaire multiple times due to has been given a special code. This study was conducted via electronic to prohibited face-to-face contact—the sampling method used *non-probability sampling* with *convenience sampling*. The research project to collecting data approval was obtained from the Institutional Board, to which the first author is belonging.

Based on **Table 1**, of the 119 participants, 103 (86.55%) were women and had a mean age of 19.94 years (range 18–≥36). Most of them were single (94.96%), undergraduate students (92.44%), and unemployed (81.51%).

Measures

Sociodemographic information such as gender, age, level of education, and marital status was obtained using a self-report questionnaire.

The Impact of Event Scale-Revised (IES-R) was initially developed by Weiss (2007) to assesses the experience of post-traumatic symptoms such as intrusion (dreams about the event), avoidance (an effort to avoid reminders of the event), and hyper-arousal (feeling watchful and on guard). It comprises 22 items with participants rate on five on a five-point Likert scale ranging from 0 (not at all) to 4 (extremely) to the extent to which each item applies to their experiences during the preceding seven days. Instructions were modified such that participants are asked about the distress caused by the COVID-19 circumstances—a higher total score indicating more post-traumatic symptoms. Cronbach's alpha is reported as 0.85.

Stress-Related Growth (SRG) was measured through the 15-item (Park et al., 1996; Cohen et al., 1998). The scale is a measure of post-traumatic growth in which participants rated how much they changed due to their most stressful event by giving the response range from 0 (no changes at all) to 6 (completely changes). All items were worded in a positive direction, for example: "I learned to be nicer to others," "I learned that there are more people who care about me than I thought." Higher scores indicate higher levels of growth. Cronbach's alpha is reported as 0.94.

Freiburg Questionnaire of Coping with Illness (FQCI) or Freiburger Fragebogen zur Krankheitsverarbeitung (FKV) was measured through the 35-item (Muthny, 1989). The FKV is measuring coping strategies that take into five coping subscales: Depressive coping, Active problem-focused coping, Distracting and self-encouragement, Religious faith and searching for the meaning of the illness, and Denying and wishful thinking. Items

can be answered on a five-point Likert-scale (from 1 = “Applies not at all”, five = “Applies very much to me”). A mean value for each subscale is computed. Higher scores represent more use of the particular coping style. Cronbach’s alpha is reported as 0.83.

All questionnaires used in this study through a scale adaptation processes including forward translation, data synthesis, backward translation, expert committee review and pretesting (Heggstad et al., 2019).

Statistical Analysis

The analysis using WarpPLS 5.0, which is a structural equation modeling (SEM) software. It employs the Partial Least Squares (PLS) method that it can refer to it as PLS-SEM. In this study, we have carried out our model in two stages: (1) Examining the measurement model’s reliability and validity. It can see from the factor loading value. Indicators are considered valid if they have a factor loading value >0.5 . It can be concluded that the measurement meets the convergent validity criteria (Chin, 1998); (2) Hypothesis testing by analyzing the structural model.

RESULTS

This study uses a convergent validity test to ensure that the indicator is a construct of the latent variable. Convergent validity can be seen from the correlation between the indicator score with the variable score. The indicator is considered valid if it has a loading factor value > 0.5 . From **Table 2**, it can show for FKV, three items (FKV25, FKV 27, and FKV 35) were dropped. This fall indicator will subsequently not be used in the calculation of the model. There were no dropped items from IES and SRG. Also, it can be seen that the composite reliability value on the variables of post-traumatic event, coping strategies, and stress-related growth are all >0.7 , which is satisfied (Chin, 1998). Further, the AVE values on all variables are >0.5 . The construct validity test is to ensure that the indicator is indeed extracted from its latent variable. Thus, concluded the indicators used in this study had met discriminant validity. This shows that the variables are consistent and can be used further for hypothesis testing.

Structure Model Testing

Testing the model’s structure through the R Square test and Path Coefficients will be the basis for hypothesis testing. **Figures 1, 2** presents the estimates obtained via PLS-SEM analysis. The model explains a significant moderate, 46% amount of variance for stress-related growth. With gender as moderator, the model presents a significant 29% amount of variance for stress-related growth, which is also moderate (Chin, 1998). It has shown the PLS path coefficients and the corresponding p -values for the model in **Tables 3, 4**. A traumatic event’s impact does not have a significant effect on stress-related growth, that hypothesis 1 is rejected.

In partial, the links $APC \rightarrow SRG$ ($\beta = 0.20$, $p < 0.01$), $DSC \rightarrow SRG$ ($\beta = 0.47$, $p < 0.01$) are positively related. Thus, based on beta values and corresponding p -values, hypotheses 2b and 2c were accepted. The event’s impact, depressive processing, Religiosity, and search for meaning, and wishful thinking, do not have a significant effect in this model (see **Table 3**).

TABLE 1 | Data demographics ($N = 119$).

Category	Total	
	Frequency	%
Gender		
Male	16	13.45
Female	103	86.55
Age (Mean \pm SD)		
18–20 (19.6 ± 0.51)	72	60.50
21–25 (22.3 ± 1.18)	40	33.61
26–30 (26.5 ± 0.70)	2	1.68
31–35 (35 ± 0)	2	1.68
≥ 36 (42 ± 5.29)	3	2.52
Marital status		
Married	5	4.20
Single	113	94.96
Cohabiting	1	0.84
Educational status		
Undergraduate students	110	92.44
High school	9	7.56
Occupational status		
Civil servants	5	4.20
Private sector workers	8	6.72
Entrepreneur	1	0.84
Part-time worker	8	6.72
Unemployed	97	81.51

Next, the links $FKV \rightarrow SRG$ ($\beta = 0.53$, $p < 0.01$) are shown positively related. Hypothesis 2 is accepted.

Hypothesis 3 and 4 were tested for the moderation effect of gender on the path impact of the traumatic event and stress-related growth and coping strategies and stress-related growth (see **Figure 2**). Both do not significantly affect this model, so hypotheses 3 and 4 were rejected (see **Table 4**).

The effect size for each path model can be determined by calculating Cohen’s f^2 . Based on the f^2 value, the omitted construct’s effect size for a particular endogenous construct can be defined such that 0.02, 0.15, and 0.35 represent small, medium, and large effects, respectively (Cohen, 1988). In **Table 5**, the small effect size on SRG was found in APC (0.077), RM (0.03), Gender*IES (0.02), and Gender*FKV. Further, the medium effect size on SRG was found in DSC (0.28) and FKV (0.30).

Additional analysis was conducted to examine differences in research variables based on gender. An independent-samples t -test was conducted to compare all variables on gender. Based on **Table 6**, there was a significant difference for IES, $2.09(117)$, $p < 0.00$, women scored higher on traumatic event ($M = 41.71$, $SD = 0.89$) compared men ($M = 36.50$, $SD = 2.49$). Further, men indicated scored higher on active coping strategies ($M = 29.98$, $SD = 0.30$) compared women ($M = 22.81$, $SD = 1.21$); $205(117)$, $p < 0.00$.

DISCUSSION

This study found that participants were exposed to trauma from the emergence of the COVID-19 outbreak in Indonesia.

TABLE 2 | The measurement model.

Construct	Item	λ	Cronbach's α	CR	AVE
IES	IES1	0.84	0.85	0.87	0.59
	IES2	0.69			
	IES3	0.64			
	IES4	0.84			
	IES5	0.54			
	IES6	0.62			
	IES7	0.54			
	IES8	0.76			
	IES9	0.51			
	IES10	0.67			
	IES11	0.55			
	IES12	0.56			
	IES13	0.58			
	IES14	0.65			
	IES15	0.54			
	IES16	0.71			
	IES17	0.73			
	IES18	0.52			
FKV	FKV1	0.69	0.83	0.84	0.54
	FKV2	0.75			
	FKV3	0.59			
	FKV4	0.72			
	FKV5	0.78			
	FKV6	0.74			
	FKV7	0.81			
	FKV8	0.85			
	FKV9	0.75			
	FKV10	0.94			
	FKV11	0.77			
	FKV12	0.81			
	FKV13	0.72			
	FKV14	0.81			
	FKV15	0.74			
	FKV16	0.76			
	FKV17	0.77			
	FKV18	0.65			
	FKV19	0.74			
	FKV20	0.69			
	FKV21	0.51			
	FKV22	0.88			
	FKV23	0.66			
	FKV24	0.64			
	FKV26	0.63			
	FKV28	0.54			
	FKV29	0.76			
	FKV30	0.76			
	FKV31	0.82			
	FKV32	0.71			
	FKV33	0.68			
	FKV34	0.73			
SRG	SRG1	0.53	0.93	0.94	0.64

(Continued)

TABLE 2 | Continued

Construct	Item	λ	Cronbach's α	CR	AVE
	SRG2	0.68			
	SRG3	0.76			
	SRG4	0.61			
	SRG5	0.77			
	SRG6	0.78			
	SRG7	0.76			
	SRG8	0.77			
	SRG9	0.73			
	SRG10	0.81			
	SRG11	0.75			
	SRG12	0.76			
	SRG13	0.66			
	SRG14	0.73			
	SRG15	0.65			
	SRG16	0.53			
	SRG17	0.52			
	SRG18	0.67			
	SRG19	0.57			
	SRG20	0.52			
	SRG21	0.73			

Inconsistent with some other studies (Siqueland et al., 2015; Zieba et al., 2019), trauma condition scores do not significantly affect the stress-related growth experienced by individuals. This is because the emergence of growth requires gradual cognitive processes and perceived traumatic experiences.

Furthermore, Brooks et al. (2016) revealed that strategic social support and coping stress allow trauma or life burdens experienced not to predict growth in participants. In line with this opinion, this study found that participants' coping significantly affected the emergence of stress-related growth. Machado et al. (2020) stated that habitual use of coping strategies is important part of the treatment in posttraumatic stress symptoms. Moreover, specifically, Girma et al. (2021) stated about Covid-19 Pandemic-Related Stress that coping strategies significantly helped patient with chronic disease. Coping strategies are significant predictors for mental health measures on traumatic events due to could improve positive thinking (Budimir et al., 2021) and resilience (Gori et al., 2021). Stress's positive or negative effects depend on coping strategies that individuals have in solving problems (Park et al., 2009). An experimental study conducted on 94 students showed that individuals' coping activities could increase individual growth, including generating positive thoughts (Park and Fenster, 2004). Individuals who use positive coping strategies tend to report high growth levels (Bi et al., 2016). Growth will impact improving personal skills and interpersonal relationships (Kesimci et al., 2005; Popa and Podea, 2013).

The coping process mechanism has an impact on one's growth after passing through an adverse experience. Research conducted by Wild and Paivio (2003) of 193 student participants related

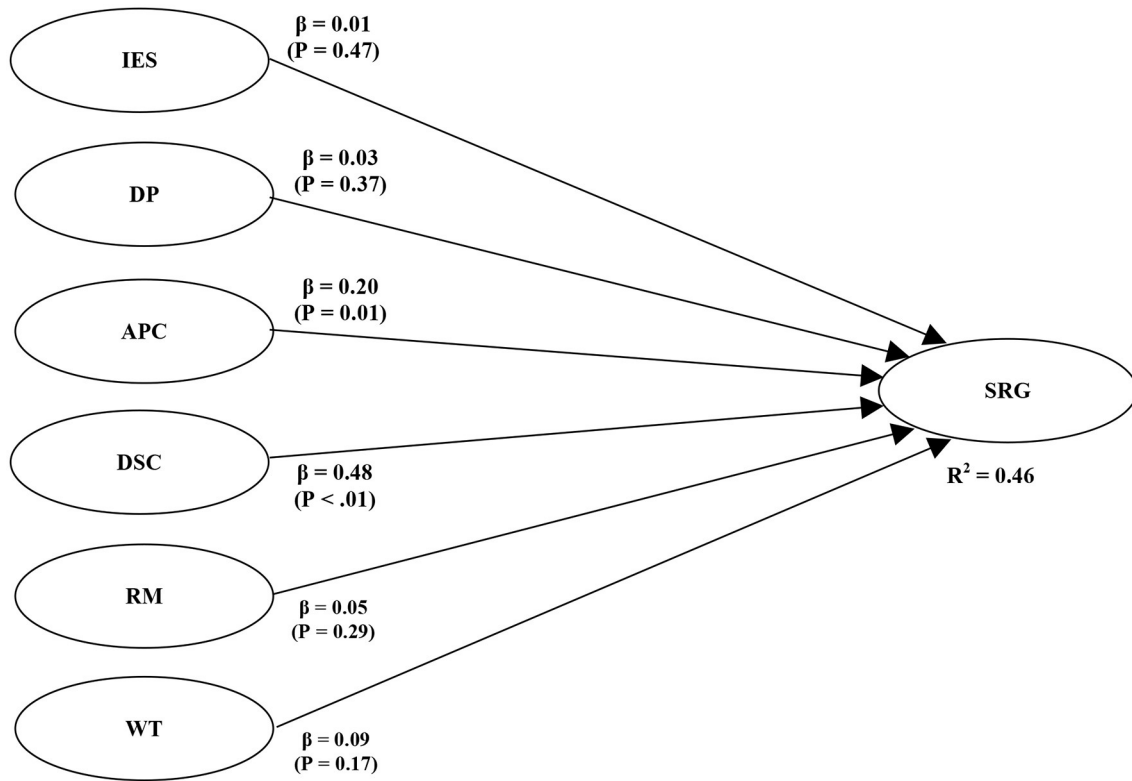


FIGURE 1 | Structural model 1.

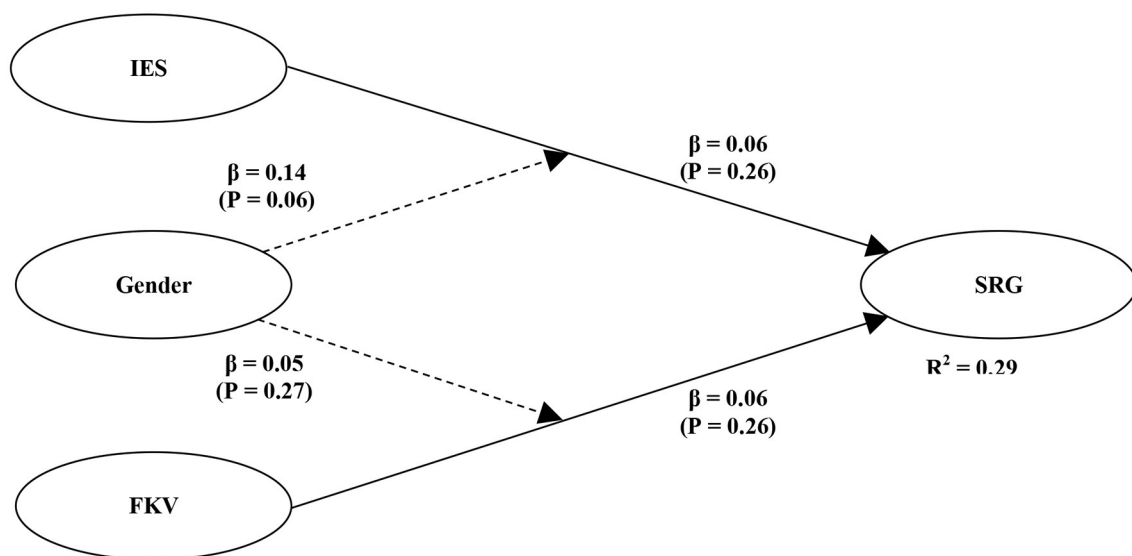


FIGURE 2 | Structural model 2.

to post-traumatic growth (PTG) shows the results that active coping and subjective well-being affect the post-traumatic growth (PTG) subject. Meanwhile, research conducted on 256 people who survived the 2010 Haiti earthquake showed a significant

positive correlation between post-traumatic growth (PTG) and active coping (Mesidor and Sly, 2019). This is also in line with Park and Fenster's research on 94 Psychology students who showed the results that both coping strategies and cognitive

TABLE 3 | Direct effect results.

	β	T values	p-value	Confidence Interval (CI)		
IES → SRG	0.01	0.04	0.48	−0.173	0.186	Not significant
DP → SRG	−0.03	−0.33	0.37	−0.209	0.148	Not significant
APC → SRG	0.20	2.33	0.01	0.029	0.371	Significant
DSC → SRG	0.47	5.76	0.00	0.32	0.638	Significant
RM → SRG	0.07	0.72	0.24	−0.127	0.227	Not significant
WT → SRG	0.03	0.37	0.36	−0.09	0.262	Not significant

TABLE 4 | Indirect effect results.

	β	T values	p-value	Confidence Interval (CI)		
IES → SRG	−0.10	−1.16	0.13	−0.278	0.072	Not significant
FKV → SRG	0.53	6.64	0.00	0.374	0.688	Significant
Gender*IES → SRG	0.20	−1.26	0.11	−0.287	0.063	Not significant
Gender*FKV → SRG	0.47	1.47	0.07	−0.043	0.304	Not significant

TABLE 5 | Cohen's effect size.

	Cohen's d
IES	0.00
DP	0.01
APC	0.08
DSC	0.28
RM	0.03
WT	0.01
FKV	0.30
Gender*IES	0.02
Gender*FKV	0.05

TABLE 6 | Independence sample T-test result.

Variable	Gender	N	M	SD	t(df)	p
IES	Women		41.71	0.89	2.09(117)	0.03
	Men		36.50	2.49		
DP	Women		15.59	1.11	0.16(117)	0.80
	Men		15.38	4.77		
APC	Women		29.98	0.30	2.05(117)	0.00
	Men		22.81	1.21		
DSC	Women		33.85	0.41	−0.13(117)	0.89
	Men		34.00	1.18		
RM	Women		34.20	0.44	1.84(117)	0.07
	Men		31.81	1.70		
WT	Women		6.48	0.18	−0.98(117)	0.06
	Men		7.00	0.71		
FKV	Women		111.11	1.11	0.03(117)	0.97
	Men		111	4.77		
SRG	Women		101.22	1.32	1.97(117)	0.06
	Men		109.25	2.81		

processes play a role in the occurrence of growth after stressful growth experiences. This study states that individuals' efforts to overcome their stressors determine the growth experienced (Park and Fenster, 2004). Supporting this statement, Amaral, in his research results, revealed that coping strategies when facing problems influence the increase in post-traumatic growth subjects (Amaral et al., 2013).

One of the positive coping strategies is self-encouragement and self-affirmation. Self-affirmation affects the openness and behavior of individuals (Stapel and van der Linde, 2011; Main and Dillard, 2012). Research conducted by Creswell et al. (2013) shows that self-affirmation can protect individuals from the adverse effects experienced by stress-related problem-solving. This research shows that individuals' chronic stress can interfere with their problem-solving performance, and self-affirmation can improve problem-solving performance under pressure. Self-affirmation protects individuals from the adverse effects of stress on problem-solving performance, even in situations of acute or ongoing stress. Self-affirmation can provide long-term influence on one's ability to grow and adapt to deal with problems that cause anxiety (Cohen and Sherman, 2014). In a study conducted on 80 student participants, self-affirmation is

known to encourage someone to be more creative so they can find insight when facing stressful and stressful events in life. Furthermore, Self-affirmation can improve one's mental health condition (Creswell et al., 2013).

Furthermore, the women in this study were more vulnerable to trauma situations. This is supported by research that women are more sensitive to traumatic experiences (Stroebe et al., 2005; Rzesutek et al., 2017). Dell'Osso et al. (2012) also reported that women significantly higher PTSD prevalence rates and post-traumatic spectrum symptoms than men. In addition, Gentry et al. (2007) reported that women has higher in overall perceived stress levels, but there was no difference in the experienced social stressors and health stressors between genders. The sensitivity of women causes the emergence of self-brooding rumination) and a lack of thinking about

self-reflective rumination (Lund et al., 2010). Furthermore, Stroebe et al. (2005) allude to the tendency of men to be oriented toward cognitive activity, so that this allows men to be more adaptive in dealing with trauma and lead to growth.

This study shows that active coping strategies and positive affirmation significantly influence individual stress-related growth. The trauma event (COVID-19) does not significantly affect growth. We assumed it because the data collection process carried out when COVID-19 has just occurred so that the construction process of the event's meaning has not been produced.

Women experience trauma compared to men, besides active coping with the COVID-19 situation is higher in men than women. Herren et al. (2021) also shown that there are differences in coping strategies between men and women. Women are more likely than men to report negative affective outcomes from emotion suppression (Herren et al., 2021). Further, Gentry et al. (2007) showed that women were more likely to use adaptive coping strategies, whereas men were more likely to use maladaptive and avoidance coping strategies. Interestingly, the religious matter is not yet significant. We assumed when in the initial phase of the pandemic, individuals are still in a state of shock, so connecting pandemics with faithful things still difficult.

This study illustrates the importance of active coping and self-affirmation in dealing with adverse situations such as COVID-19. Interventions about coping skills and positive affirmations are essential for vulnerable groups such as the women population. The number of male participants are not equal to the number of women is a limitation in this study.

Future studies will undoubtedly benefit from longitudinal designs using more diverse samples. We plan to continue

this research to make repeated measurements of trauma and post-traumatic conditions, explore more deeply growth factors regarding COVID-19, and broaden the study participants' demographic characteristics.

DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by Faculty of Psychology, Diponegoro University. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

DK: research design and manuscript writing, modeling, data collection, and data processing. MS: research design and manuscript writing. LA: manuscript writing. All authors contributed to the article and approved the submitted version.

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Coping Strategy, Social Support, and Psychological Distress Among University Students in Jakarta, Indonesia During the COVID-19 Pandemic

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The COVID-19 pandemic has challenged the world for a year, where a study in China showed that the disease increased psychological distress among adolescents and college students, such as anxiety about the academic setback, economic effects, and impact on their daily life. However, a further study examining the impact of the disease on the mental health of students is required. Social support is the most vital psychosocial protective resource, where effective coping can reduce stress levels and prevent individuals from experiencing more severe psychological distress. Therefore, this study investigated the coping strategy, social support, and psychological distress among university students in Jakarta who are also the epicenter of COVID-19 in Indonesia. The psychological distress and coping strategy variable were measured through the Hopkins Symptoms Checklist-25 (HSCL-25) and the COPE Brief instrument, respectively. Meanwhile, the Multidimensional Perceived Social Support-12 instrument was used to measure the social support variable. The study was disseminated via an online form and the number of research subjects included 250 students who matched the research criteria, including DKI Jakarta domicile and active students registered in the area that were confirmed to be COVID-19 positive. According to the results, coping strategies and increased social support were significantly correlated with decreased psychological distress and may serve as the basis for interventions.

Keywords: coping strategy, social support, psychological distress, COVID-19, university students

INTRODUCTION

Pneumonia Coronavirus Disease 2019, also known as COVID-19 is an inflammatory lung disease caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2). Moreover, elderly people and those with a history of disease were known to be more susceptible to the infection due to weak immunity. The World Health Organization (WHO) needed to establish a pandemic status related to COVID-19 due to the continuous increase in the disease cases of more than 118,000 in 114 countries, which originated from Wuhan with the death of 4,291 people (World Health Organization, 2020).

In general, the pandemic is associated with several psychosocial stressors, such as health threats of oneself and loved ones, severe disruption to routines, separation from family and friends, lack of food and medicine, disturbance on economic condition, social isolation due to quarantine or other social distancing programs, and school closings (Shultz et al., 2019). The role of psychological treatment in the patient management process or disaster mitigation schemes in affected communities cannot be ignored (Shultz et al., 2015). Furthermore, in a study conducted in the Chinese region, approximately 35% of the 52,730 respondents affected by the COVID-19 pandemic, experienced psychological distress (Qiu et al., 2020).

Psychological distress in adolescents, can arise due to accumulated anxiety and worry about their health and that of their relatives or friends, changes in sleep and eating patterns, difficulty in thinking or concentrating, worsening chronic health problems, increased alcohol and tobacco use, as well as other drugs (Centers for Disease Control and Prevention, 2020). One global survey discovered that 83% of adolescent respondents agreed that the pandemic worsened pre-existing mental health conditions, mainly due to school closing, loss of routines, and limited social connections (YoungMinds, 2020). The mental health of the students deteriorated due to lose of contact with friends, concerns about the assessment of their grades, and its impact on their university or career prospects. Also, concerns about home learning for practical reasons, stress related to the pandemic, and losing their “safe” place, or non-conducive home environment, contributed to the deterioration (YoungMinds, 2020).

The consideration of psychological distress and mental health symptoms was essential during the COVID-19 pandemic. Also, the unprecedented consequences of the disease, including widespread unemployment and lost income, health-related concerns, and mandatory social isolation are the likely risk factors for increases in forms of psychological distress among the general population. By design, population-based approaches to virus control have imposed significant environmental and contextual constraints for large portions of the population, hence resulting in extensive changes to daily routines and social interactions. Moreover, behavioral theories of psychological distress suggest that reductions in access to environmental or social rewards, and increases in reward-limiting stimuli (i.e., environmental suppressors) predict risk for mental health. By way of constraining daily routines and reducing access to typical sources of social or environmental reinforcement, strict social distancing measures may increase the risk for individuals’ psychological distress (McPhee et al., 2020).

Approximately 25% of the college student samples were reported to experience symptoms of anxiety, which positively correlated with increased concern about the academic setback, economic effects of the pandemic, and impact on daily life (Cao et al., 2020). Therefore, further research examining the impact of COVID-19 on the mental health of students is essential (Grubic et al., 2020). In health psychology studies, social support was associated with reduced cortisol response to stress and better immunity, as well as the most vital psychosocial protective resource according to Taylor (2015). Also, emotionally satisfying

social bonds reduce the effects of stress and hopefully, the negative impact possibility of stress on health.

Turner-Cobb et al. (2000) in Taylor (2015) revealed that social support is associated with reduced cortisol response to stress and associated with better immune function or immunity (Herbert and Cohen, 1993). The factor required to suppress the psychological distress experienced by patients, survivors, and their families (Mohammed et al., 2015). Consequently, subjects in a qualitative study stated that the social support they received had a great influence on their ability to face stress (Rabelo et al., 2016). This factor has become fairly important in communities within China during the pandemic because it affects the level of stress and anxiety in medical personnel (Xiao et al., 2020). In another work, social support was negatively correlated with anxiety levels in college students (Cao et al., 2020). However, this study showed that this is a self-protection factor that cannot be ignored.

Regarding the role of social support during a pandemic, people often feel fear and anxiety, not only about the disease but also the uncertainty of its duration, social restriction, and financial problem that arise consequently. Individuals react to psychosocial stresses, such as threats, or actual events (pandemic) in various ways (Taylor, 2019, 2015). However, along with the COVID-19 pandemic, large-scale social restriction and self-isolation can limit the availability and acceptance of social support even though the aim is to stop the spread of the disease. The Indonesian Ministry of Health released guidelines for the public and professionals to maintain mental health as a form of public education related to the importance of social support during the pandemic. Particularly, the social support can be in the form of hotline provision for online psychological services or publication of positive stories about the experiences of people who had been infected with this disease (Indonesian Psychiatric Association, 2020). Coping behavior is a mechanism commonly used in stressful situations regardless of the need for social support as an internal protective factor to overcome distress during a pandemic (Lazarus and Folkman, 1984).

Coping is something that exceeds one’s ability, a cognitive effort, and a constantly changing behavior used to manage external and internal demands considered as a burden (Lazarus and Folkman, 1984). The personality characteristics brought by each person to a stressful event can also affect how they deal with the situation (Taylor, 2015). During a pandemic, everyone can set the best coping mechanism for themselves by regularly seeking information about health risks or responding to the disease by minimizing related information received to avoid anxiety. Taylor (2019) explained that the two responses are the forms of coping executed by the community with their respective advantages and disadvantages. Effective coping can reduce stress levels while preventing individuals from experiencing more severe psychological distress. Therefore, this mechanism is defined as the thoughts and behaviors used for managing internal and external demands from situations that are considered stressful (Folkman and Moskowitz, 2004). Evidently, every individual has different coping steps in dealing with stress.

The Pandemic Management Theory (PMT) is a psychological concept based on the bio-centric health management approach, which includes the definition of six phases of coping with the

lockdown burden and the further load process of the COVID-19 pandemic. Bio-centric education teaches the inner basics of how to live as a relationship-oriented and ecological human within a natural and cosmical network. Coping to protect the connection between humans and themselves, others, and the complex of living beings support options (nature) are shown in six bio-centric fields of action during and after pandemics, including (1) maintaining effective communication, (2) maintenance of lively corporeality, (3) contact with one's own identity and inner oriented self-reflection together with others, (4) construction of life sense and expression of life potentials, (5) expansion of consciousness and perception of the wholeness, and (6) development of ecological awareness and sustainable bio-centric lifestyles and attitudes (Stueck, 2021).

Also, the consideration of protective factors, including social support and coping strategies is essential as a priority in dealing with COVID-19, especially when psychological distress exists in the adolescent and student community. Son et al. (2020) showed that the coping mechanism of students due to stress and anxiety caused by the disease was accomplished by seeking support from others or by helping themselves through adopting negative or positive methods, such as ignoring news about COVID, meditation, breathing exercises, and spiritual approaches. The use of passive coping, continuous exposure to information about the pandemic, and not having a partner as a source of social support, are factors that result in the high level of psychological distress in the Chinese society during the outbreak (Yu et al., 2020).

Reflecting on the psychological evaluation of the pandemic that occurred in May 2020, approximately 69% of the total of 2,364 respondents in Indonesia experienced psychological problems, such as anxiety, depression, and psychological trauma (Indonesian Psychiatric Association, 2020). Further studies are required regarding social support and coping among students in Jakarta, who are the epicenter of COVID-19 in Indonesia. The hypothesis presented by this study is that these factors can reduce the level of psychological distress. Therefore, the results are expected to provide input to policies or learning materials for the community.

MATERIALS AND METHODS

Participants

The purposive sampling technique was used in this study and the number of subjects included 250 students who matched the research criteria, namely Jakarta domicile, those registered in the area, and were confirmed to be COVID-19 positive. Also, the snowball sampling method was used by the investigators to invite a potential study participant group consisting of 10 individuals through the social media platform. Subsequently, the first set of invitees forwarded the invitations to 10 of their contacts whom they considered suitable, and the second set proceeded in the same manner. Participants filled the anonymous basic information online, provided a history of unreported serious mental illness and informed consent, then the participants continued to the three questionnaires.

Procedures

Eligible participants were asked to complete the questionnaires that contained three distinct sets of items between 20 and 30 min. The first set of items queried demographic characteristics and experience attributed to COVID-19 and included psychological distress questionnaires. Subsequently, participants proceeded to the second set that assessed coping strategy and then the third, which included social support questionnaires. Additionally, two questions appeared at the end of the survey asking the participant to confirm that (1) questions were honestly answered and (2) attention was paid to the survey. Participant data were excluded if they incorrectly responded to > 1 attention checks to control for random responding. The study was disseminated via an online form.

Measures

This study used the quantitative research method and the variables included psychological distress, coping strategy, and perceived social support.

Psychological Distress

The Hopkins Symptom Checklist-25 (HSCL-25) explores the symptoms of depression and anxiety and is a validated tool for measuring the level of psychological distress Derogatis et al., 1974. This tool corresponds well to DSM-IV, which defined depression and anxiety disorders, depression, phobia, and somatoform illness using "the Composite International Diagnostic Interview" (CIDI) as a gold standard diagnostic instrument. The 25 items were scored on a scale from 1 (not bothered) to four (extremely bothered) and the "forced" two-factor analyses were in favor of a one-factor solution, although the HSCL-25 measures anxiety and depression dimensions. Therefore, the anxiety, depression, and the mean total HSCL-25 scores were provided in this study, but only the score was used to define psychological distress. This instrument is the result of an adaptation by Turnip and Hauff (2007) with a total of 25 items. Moreover, the reliability coefficient of the HSCL-25 instrument was $\alpha = 0.948$ and all items of more than 0.3 had a correlation coefficient; hence they are valid from the test results used on 250 participants.

Coping Strategy

Moreover, the coping strategy variable was measured by the COPE Brief instrument designed by Carver (1997), which consisted of 28 items with two strategy types, namely problem- and emotion-focused coping. Brief COPE consists of 28 items that measure 14 different coping strategies, including active, planning, positive reframing, acceptance, humor, religion, emotional and instrumental support, self-distraction, denial, venting, substance use, behavioral disengagement, and self-blame. The main question was: What do you usually do when you are stressed by a problem? Furthermore, the coping strategies were described in statements, such as "I work or do other things in order not to think about the problem." Each statement was graded on a four-point Likert scale, where 1 = very seldom, 2 = fairly seldom, 3 = fairly often, 4 = very often. Also, each

of the 14 coping strategies was indicated by two items. From the test results used on 250 participants, the reliability coefficient of the COPE Brief instrument was known to be $\alpha = 0.822$ and only 26 of the 28 items were valid because item numbers 4 and 11 had a correlation coefficient below 0.2 causing them to be invalid.

Perceived Social Support

The Multidimensional Scale of Perceived Social Support Scale (MSPSS), is a 12-item and self-report instrument, which is easy to administer and was developed by Zimet et al. (1988) to measure social support. This equipment measures individual's social support from three specific areas with 4 subscales namely family, friends, and significant others. Items were measured on 7-point Likert-type scale from 1 "very strongly disagree" to 7 "very strongly agree." The MSPSS evaluated perceived social support (PSS) from family (FA), friends (FR), and significant others (SO) as well as quantified the degree to which respondents perceive support from each of these three sources. This instrument has been adapted into Indonesian with reliability $\alpha = 0.931$.

RESULTS

A total of 250 participants consisting of university students suspected of having COVID-19, residing in communities where cases of the disease had been reported, 72% female and 28% male, with 58% between ages 20–21 received the invitation to the online survey and finished all the questionnaires. **Table 1** shows approximately one-third (38%) of respondents had an academic impact, such as long-distance learning, lectures, internet access, signals, etc., during the COVID-19 pandemic. Of the 250 respondents, 76% had high levels of psychological distress using the Hopkins Symptoms Checklist-25 with a score ≥ 1.75 . **Table 2** shows the mean scores included problem- 30.77 ± 3.85 and emotion-focused coping 47.94 ± 5.55 ; friend 20.23 ± 5.28 and family support 19.07 ± 6.52 as well as significant others support 20.22 ± 6.77 .

In this study, of the 250 respondents suspected of COVID, 76 and 24% had high and low psychological distress, respectively. The suspected participants had demographic characteristics of mostly female (72%) between the ages of 20–21 years. **Table 2** shows these individuals frequently used emotion-focused coping

to deal with the stressor, and had support from friends, significant others, and family.

Furthermore, the binary logistic regression also identified that predicted high psychological distress among respondents included emotion-focused coping ($p < 0.05$), support from friend ($p < 0.05$), and significant others ($p < 0.05$). **Table 3** shows the following factors, including problem-focused coping and support from family did not predict high psychological distress among student cases. The results showed that there is a negative effect of coping strategies on psychological distress in the individuals affected by the COVID-19 pandemic. In addition, the most positive and negative contribution to psychological distress in this study was emotion- and problem-focused coping, respectively.

DISCUSSION

Social Support and Psychological Distress

The study results support other findings which stated there is a negative correlation with the students' anxiety level in China during the pandemic (Cao et al., 2020). Approximately 24 and 76% of the participants had low and high psychological distress, respectively. This outcome showed that the students' psychological state was quite worrying because the majority had high psychological distress, which could be caused by impacts in various aspects experienced by these individuals, such as the economic part, students' academics, and psychology, as well as medical needs, due to the pandemic. Also, having family members, friends, neighbors who suffer from COVID-19 worsened their state during this period. Psychological distress in this study was measured through the suitability of the depression and anxiety symptoms by including some somatic items in participants during the last 7 days. Various forms of concrete or tangible social supports can be provided to students, such as the provision of food or internet networks. This decision was based on the fact that most students' academics were impacted by the COVID-19 pandemic through long-distance learning, lectures, internet access, signals, etc.

Also, emotional support and information, such as counseling services via telemedicine were required by students because approximately 30.4% of the respondents experienced a

TABLE 1 | Demographic characteristic of the participants.

Characteristic	Sub-group	N (%)
Gender	Male	70 (28%)
	Female	180 (72%)
Age	18–19	41 (16.4%)
	20–21	145 (58%)
	22–24	64 (25.6%)
The number confirmed positive for COVID-19	No	0
	Yes	250 (100%)
The impact of COVID	Psychological impact (worry, irritability, sleep difficult, etc.)	165 (30.4%)
	Medical issues (medication, difficulty to participate in clinic or hospital check-up, etc.)	51 (9.4%)
	Academic impact (long-distance learning, lectures, internet access, signals, etc.)	208 (38.4%)

TABLE 2 | Psychological distress, coping strategies, and social support in Jakarta.

Hopkins symptoms checklist-25	N (%)	
Score < 1.75	60 (24%)	
Score ≥ 1.75	190 (76%)	
Brief COPE	Mean ± SD	Range
Problem-focused coping	30.77 ± 3.85	0–40
Emotion-focused coping	47.94 ± 5.55	0–64
Multidimensional scale of perceived social support	Mean ± SD	Range
Friends	20.23 ± 5.28	0–28
Family	19.07 ± 6.52	0–28
Significant others	20.22 ± 6.77	0–28

psychological impact due to the pandemic. According to Taylor (2015), social support is the most vital psychosocial protective resource, where emotionally satisfying social bonds reduce the effects caused by stress and its bad effects on health. This factor was measured by how it was perceived by students from their friends, family, and significant others. The distress symptoms due to the pandemic were high, including unfounded sudden fear, feeling restless or uneasy, sad, lonely, and less energetic. Moreover, blaming themselves for everything, crying easily, losing appetite, worrying excessively about various things, thinking that everything requires a lot of effort, somatic symptoms, such as headache, and the highest impact of difficulty sleeping. These findings also support another study conducted by Arvidsdotter et al. (2016), which stated that the themes discovered in individuals with psychological distress include difficulties in coping with daily life characterized by a feeling of being haunted by worry and fear, stress, and the inability to calm down. Also, disturbed sleeping by restlessness despite feeling tired, uncertain, and fluctuating emotional state, such as feeling happy, sad, angry, giving up and hopeless, declining tolerance levels, becoming easily frustrated, and irritated with others. Individuals may feel inferior to others, which is indicated by self-depreciation and social isolation and lose one's grip on life, which is showed by loss of enthusiasm and spirit of life. Furthermore, disorientation and closure of the individuals' feelings and emotional life result in a lack of empathy and the disappearance of the tendency to give and receive love (Arvidsdotter et al., 2016).

Coping Strategy and Psychological Distress

The COVID-19 pandemic situation, which is an event of uncertainty, often triggers stress. Lazarus and Folkman (1984) explained that stressful situations cannot be avoided in life, therefore, a coping mechanism is required to overcome them. Also, the study result which showed that coping strategies had a negative effect on psychological distress in students affected by the COVID-19 pandemic, was in accordance with the theory made by Lazarus and Folkman (1984). These individuals stated that coping can help individuals tolerate and master stressful conditions that can trigger psychological distress. The study data

TABLE 3 | Factors predicting high psychological distress in participants.

	95% CI		β	<i>p</i> -value
	Lower	Upper		
Coping style				
Problem focus coping	−0.011	0.039	0.080	0.028
Emotion focus coping	0.019	0.051	0.315	0.000
Social support				
Significant others	−0.028	−0.002	−0.145	0.024
Family	−0.033	0.001	−0.119	0.069
Friend	−0.041	−0.016	−0.265	0.000

also showed that the respondents used problem-focused coping strategies more than the emotion- form. Also, the regression test displayed that the problem-focused coping regression coefficient on psychological distress was negative, hence these strategies are said to be a negative predictor of psychological distress. This is in accordance with a previous study conducted by Mclean et al. (2007), which stated that this mechanism was more frequently used and has a negative effect on student psychological distress. The findings also show that some respondents used emotion-focused coping strategies in dealing with this problem. This is in accordance with the opinion of Lazarus and Folkman (1984), which stated that the majority of the respondents were students with cultural value and personal belief in the formation of personality or cognitive configuration from the culture, hence making them more focused on feelings in dealing with stressful situations. The study result conducted by Vungkhanching et al. (2016) also showed similar evidence, namely the emotion-focused coping strategies affect psychological distress in students.

Also, the results show that several coping strategies have a significant effect on psychological distress, namely the strategy of behavioral disengagement, venting, denial, use of emotional support, humor, and self-blame. The coping strategy that most positively contributes to psychological distress is behavioral disengagement, which involves giving up on making efforts to solve problems. This is in accordance with the opinion of Lazarus and Folkman (1984), which stated that the COVID-19 pandemic situation that occurred in Indonesia can trigger stress and paralyze the anticipatory coping process; hence several individuals choose to conduct behavioral disengagement strategies that ultimately increase their distress level. The strategy that most negatively contributes to psychological distress is the use of emotional support, which is performed by obtaining emotional support or comfort and understanding from others. This was in accordance with the opinion of Lazarus and Folkman (1984), which stated that coping, can come from an external party and consists of the received social support and socio-economic condition. The social support obtained in the form of emotional assistance, information, or real assistance will become the resources for individuals and facilitate them to deal with stressors and reduce distress levels. Also, the results of the descriptive study show that the impact on the respondents' academics, such as long-distance lectures and difficulty accessing the internet or quotas, and psychology, including stress, anxiety, and irritability had higher category of psychological distress than those with

impact on their economic or difficulty in accessing medical care. In addition, the number of confirmed (positive) COVID-19 patients in the area where the respondents live, was directly proportional to the tendency of having a higher psychological distress. This is in accordance with the opinion of Taylor (2019), which stated that several people experience anxiety that weakened them during the pandemic and even interfered with their daily life. Also, depression and sadness are widespread, especially when one or more of closely related persons are positive for COVID-19, where people with high levels of vulnerability and intolerant of uncertainty will be particularly stressed during the pandemic.

According to a study by Moret-Tatay et al. (2016), the Bayesian network model showed higher probabilities of mental health problem symptoms for emotion-focused coping than for the problem-form. However, no differences were discovered regarding gender, hence suggesting the use of problem-focused coping was more recommendable for both male and female university students and may provide some benefits in terms of symptomatic treatments of mental health problems. Based on the results, there was an effect of both strategies on the psychological distress in students affected by the COVID-19 pandemic. According to Carver (1997), coping is an effort used to prevent or reduce threats, losses, or suffering. This process can also be a protective factor because the efforts used to manage excessive stress can reduce psychological distress and have negative consequences on physical health in a short and long period.

Coping Strategy, Social Support, and Psychological Distress

The study results emphasize the need to investigate coping strategies in the general population and teach them during pandemic outbreaks. This approach may lay a solid foundation for individuals to cope positively and actively with various stress factors and circumstances. The results suggest several considerations for helping the general population in handling the psychological distress caused by the COVID-19 pandemic. These considerations include firstly, fear of COVID-19 is common in the general population worldwide, and the best way to end this occurrence is to learn about the disease and actual risk to others. Secondly, people should be encouraged to work together with colleagues to reduce financial stress, as being unable to work during the pandemic may lead to stress-related job status or financial situation. Thirdly, providing health support, such as a telephone hotline for communication and consulting may help reduce the distress associated with social distancing, quarantine, or isolation. Finally, connecting people with others for giving and receiving social support online can bolster psychological well-being. In addition, feeling lonely and isolated from others is common during the lockdown, and regularly connecting with friends and family through video or phone calls may improve the level of social support.

Limitations

There are several limitations in this study, which include the surveying process based on network (online) invitation

rather than face-to-face random sampling, and requirements of participants to use the Internet. Therefore, it is unclear whether the results can be generalized to individuals who cannot use the Internet. Secondly, respondents' engagement in the prevention process was not assessed as preventive self-behaviors can also mediate stress levels. Thirdly, the study design was cross-sectional; hence the changes in psychological distress and its predictors throughout the COVID-19 outbreak could not be captured. Therefore, the long-term psychological process and implications of infectious disease outbreaks should not be ignored. Finally, approximately 72% of the respondents were women, which may reduce the generalizability of the findings to the university students in Jakarta population.

CONCLUSION

The study results can be used as scientific evidence of the coping strategies effects on psychological distress in students affected by the COVID-19 pandemic. Also, an understanding can be provided on these strategies, psychological distress and their relation to the disease, as well as the enrich results related to coping strategies, and psychological distress. This study can be used as a reference for students in choosing coping strategies as an option in overcoming any pressure that arises due to the COVID-19 pandemic. Psycho-education programs through webinars can be conducted to provide an overview for these individuals on the selection of coping strategies and the right way in dealing with pressure. Therefore, psychological distress was experienced by the students during and after the COVID-19 pandemic.

DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding author/s.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethics Committee of Faculty of Education Psychology Universitas Negeri Jakarta. The participants in this research also received a complete description of this survey and provided online written informed consent that already reviewed by ethics committee. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

ZA had full access to all the data, the idea for and designed the study, took responsibility for the integrity of the data, and the accuracy of its analysis. MA did the analysis and edited the

manuscript and ZA collected the data while both drafted the manuscript. Both authors agreed to be accountable for all aspects of the work in ensuring that questions related to the accuracy and integrity of any part are appropriately investigated and resolved. Both authors carefully revised the manuscript for important intellectual content and gave final approval for the version to be published.

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Psychological Adjustment, Quality of Life and Well-Being in a German and Portuguese Adult Population During COVID-19 Pandemics Crisis

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Introduction: The pandemics crisis had consequences in psychological adjustment of persons all over the world. The current study analyzes comparatively the topics of quality of life, and well-being, considering as predictors trait anxiety, feeling of threat, difficulty to relax, empathy and pro-social attitude, health care, sleep quality and optimism, in a population of German and Portuguese adults during the pandemics, in order to obtain a deeper understanding of the psychological reactions to crisis across countries and cultures.

Methods: A sample of 470 adults divided in three age groups – young adults (18–34 years), middle-age adults (34–54 years) and old adults (55 years and older) – completed a self-report questionnaire assessing socio-demographic data, quality of life, well-being, quality of sleep, trait anxiety, Coronavirus threat, optimism regarding the pandemics, difficulty to relax, empathy, and pro-social attitude during the pandemics period.

Results: Portuguese participants expresses higher empathy and pro-social attitude and health care but in Germany people have higher quality of sleep. Young adults (a) rated their quality of life lower than middle-age adults and old adults, (b) showed also lower optimism than middle-age and old adults, and (c) showed lower well-being than middle-age.

Conclusions: Young adults rated their quality of life, optimism and well-being during pandemics lower than middle-age and old adults, and experienced higher levels of trait anxiety and difficulty to relax. It seems that young adults show a lower psychological adjustment than other age groups during COVID-19 crisis. It is concluded that quality of life, optimism, and well-being during the pandemics are affected differently according to country and group of age, suggesting individual differences across cultures and ages, and consequently the need of specific interventions to cope with the psychological reactions to pandemics crisis.

Keywords: well-being, quality of life, COVID-19, mental health, optimism, individual differences COVID-19, Mental health

INTRODUCTION

The COVID-19 pandemic is rocketing around the world. It is universally known that the disease affects several body systems. Notwithstanding, it is becoming more and more evident that also mental health may be heavily affected, not only in infected people, but also in health-care professionals working in hospitals and in the population as a whole. Vindegaard and Benros (2020) searched studies measuring psychiatric symptoms or morbidities associated with COVID-19 among infected patients and among non-infected groups (psychiatric patients, health care workers and non-health care workers). They found a high level of post-traumatic stress and of depressive symptoms in infected persons. On the other hand, compared to before COVID-19, they found a worsening of psychiatric symptoms in patients with preexisting psychiatric disorders, increased depression/depressive symptoms, anxiety, psychological distress, and poor sleep quality in health care workers, and lower psychological well-being and higher scores of anxiety and depression in general public. Negative symptoms were associated to factors like female gender, poor-self-related health and infected relatives.

Patients with COVID-19 not only experience a range of neurological, cognitive and psychiatric symptoms, like dizziness, confusion, seizures and delirium (Fotuhi et al., 2020; Helms et al., 2020; Mukhtar, 2020), but their general well-being can be affected. Stam et al. (2020) describe possible aftereffects of COVID-19 like anxiety disorders, cognitive problems and other difficulties like muscle weakness, severe fatigue and neuropathies.

Non-infected people may present nevertheless some troubles. Beyond fear and contagion danger, the biggest lockdown in the lives of most of the people called dramatic changes in everyday behavior: Wearing masks, physically distancing, avoiding human contacts. The consequences range from PTSD to stress, anxiety, depression, domestic violence, marital problems, and fear before the consequences of financial problems.

Chinese studies conducted during the height of the outbreak in China during 2020, showed serious disruptions of normal life. Zhou et al. (2020) studied 8079 Chinese teens (12 to –18 years old) and found that 44% showed depression, 37% anxiety and 31% both. Li et al. (2020) studied sexual activity of the population in a sample of 459 heterosexual individuals of both genders (8 to –45 years old). They reported a reduction in sexual desire (25%), a decrease in the number of sexual partners (44%), a decrease in frequency of sexual activity (37%) and a reduction in sexual satisfaction (35%). On the other hand, knowledge about COVID-19 seems to lead to more emotional well-being according to Yang and Ma (2020), who conducted a nationwide survey before and after the COVID-19 outbreak. The study found a 74% drop in emotional well-being during the outbreak, but a higher level of self-perceived knowledge about the disease was associated with higher emotional well-being. A special mention was devoted by Chinese researchers to the situation of elderly people, the most vulnerable group in this pandemic. According to Yang et al. (2020), not only the fear of the disease itself, but also the hard limitations to social and familiar life had a negative effect on the emotional and cognitive functioning of

the elderly, causing often panic, and anxiety states. These results were corroborated in Spain. González-Sanguino et al. (2020) analyzed the responses of 3,400 persons between 18 and 80 years old to a survey on mental health symptoms and found significant levels of symptoms for depressive disorder (19%), generalized anxiety (19%) and PTSD (16%). The lack of a net of relationships (loneliness) was associated with a higher level of symptoms and women and young people seemed to be more attained than men and elderly. On the other hand, persons who had been infected or had infected relatives were more likely to show these symptoms.

The isolation measures applied in Europe (v.gr. in Portugal and Germany), limited the availability of usual services for vulnerable groups (elderly, persons with chronic or mental diseases) (Armitage and Nellums, 2020; Yao et al., 2020). An additional burden is that the uncertainty about the possibility of becoming ill and dying and about the health of family and friends has heightened dysphoric mental states (Shigemura et al., 2020).

Additionally, it has been found, that alone the fear of COVID-19 can be associated to anxiety disorders and depressive states, in the context of a constant flow of real or fake news on the pandemics (Armitage and Nellums, 2020). Also Garfin et al. (2020) have found that a certain amount of media exposure to the pandemics is associated with psychological distress, like increased anxiety, acute and posttraumatic stress, which in turn amplifies stress responses leading to general health problems like cardiovascular disease, as well as to misguided health protective behaviors.

With the aim of reducing the spread of the virus, the overload of healthcare systems and infection-related mortality, most governments have implemented public health measures (such as lockdown, quarantine, physical, and social distancing) on the population. The impact of these measures can be different. Horeh and Brown (2020) and Tull et al. (2020) found that the effects of lockdown differs from person to person—those who appreciate to be at home may enjoy it, but others may feel frightening the lack of human interaction. For instance, Pirchio et al. (2021) point to the importance of contact with nature, especially in the case of young people, for promoting the well-being, i.e., the lack of outdoor experiences can be a very important in triggering mental health problems. So, COVID-19 is testing the way of life of people all around the world, raising questions on quality of life, and well-being, threat feelings, empathy and pro-social attitude, health care, sleep quality, and optimism, whose answer may be different in different groups of population and in different countries (Bidzan-Bluma et al., 2020).

Current data show that the pandemic is negatively affecting family relations and is limiting seriously the employment of some population sectors, like those working in the service industry. Consequences on mental health may be evident sooner or later (APA, 2020). It is a known fact, that social isolation, especially perceived social isolation increases the risk of cardiovascular, autoimmune, neurocognitive, and mental health problems (Santini et al., 2020). It is known that difficult relationships in the family may undermine the health of the person more than other relationships (Woods et al., 2020). It is

also known that losing the own job is detrimental to physical and mental health (Karsten and Moser, 2009). Consequently, increases in mental health concerns have grown (Holmes et al., 2020). It is perhaps too early for a complete understanding of the current COVID-19 pandemics all over the world. It is evident the lack of a theory able to explain the psychological mechanisms and processes that occur in persons and in groups of people in such a situation, especially the effects of restrictions and control measures applied by state agencies. Nevertheless, health psychology, as the study of social, cognitive, and behavioral processes involved in health, illness and healthcare (Johnston, 1994; Ogden, 2012) provides a convenient point of departure for the development of a theoretical framework to understand from a psychological perspective the effects of the current epidemics situation on well-being and quality of life. That health is not only a product of biological processes, but also of beliefs, expectancies, habits, and interpersonal relations is a well-established fact since the end of the twentieth century (see Sterling and Eyer, 1981). Since then, a great amount of research has followed. Also, research on topics like burden management and coping strategies in extreme situations, and on stress and burnout (Fink, 2016) are significantly important for such an understanding as Pfefferbaum and North (2020) keenly point out. An important development for the purposes of the current paper is the inclusion in health psychology of the concepts of life satisfaction and quality of life, defining the former as an individual evaluation of the own life, and the latter as the level of general well-being (Bidzan-Bluma et al., 2020), as well as the concept of well-being, defined as the combination of six distinct components of positive psychological functioning (Ryff and Keyes, 1995).

In the context of the current interest to assess the effect of the pandemics, The Academy for Work Health in Leipzig, Germany launched an international research under the name of “Psychological coping, possibilities of crisis intervention and aftercare in companies and institutions for adults, parents and children” for a better understanding of the psychological reactions to coronavirus pandemics crisis in different countries. The present study, included in this major project, analyzes the characterization of perceived quality of life and well-being during the pandemics, on one side, and on the other the relationship to factors like perceived threat of Coronavirus, optimism regarding the pandemics, difficulty to relax, trait anxiety, sleep quality, and empathy and pro-social attitude, in a sample of adult persons from Germany and Portugal.

MATERIALS AND METHODS

Sample

The sample of this study consists of 470 participants from Germany (470 persons) and Portugal (69 persons). In the frame of a series of studies comparing the different countries participating in this project, it was decided to compare in the current study Portugal and Germany, being Germany the country leading the research and Portugal the home of the authors. One more reason was that there were some differences between

the two countries in the application of the rules to cope with the pandemic in the same period—April and May 2020. In Portugal, the first two cases were confirmed on 2nd March. On 12th March, the government declared the highest level of emergency. A strict lockdown was immediately applied, people were told to stay at home, all the restaurants, bars and night clubs, schools, universities, and social care institutions for elders were completely closed, as well as borders and airports. All work was interrupted and only the professionals of emergency, health, and public security could work physically. All political parties supported the measures and the Portuguese population accepted and accomplished the rules without opposition. These measures were maintained until the end of May 2020, once the first wave had been controlled. Opposition movements (“Negacionistas”) appeared later and remain small.

The first case in Germany was announced on 27th February 2020. A huge outbreak linked to carnival events in North-Rhine-Westphalia appeared during the month of March. On 13th March, the German government closed schools and kindergartens, limited the functioning of the working population and prohibited visits to nursing homes. These measures were sharpened in the following days, always differently in the different German Länder. In some regions, physical contacts were prohibited, in other curfew were imposed, and some borders to some countries were closed. The process of restrictions was applied with different degrees of agreement in the German Länder, with evident opposition of power groups, with critical comments of some political parties and even after some struggle between the federal government and the regional governments. All these measures began to be eliminated after some successes from 15th April on, re-establishing a relative normality by June, in spite of some controlled outbreaks in factories with poor working conditions. Civil opposition movements (“Querdenkers”) appeared from the very beginning.

The mean age was 45.41 (range 16–80, $SD = 12.72$) for German participants and 37.28 (range 18–66, $SD = 16.21$) for Portuguese participants. The sample was divided in three age groups (Table 1):

1. Young adults: 18–35 years old ($n = 122$).
2. Middle-age adults: 36–54 years old ($n = 214$).
3. Old adults: 55+ ($n = 129$).

The age of German participants ($n = 401$) ranged from 18 to 80 years: Young adults (89) from 18 to 35 years; middle-age

TABLE 1 | Participants.

Variables	Age group	Mean	SD	N (%)	Labor satisfaction
German	1. Young	28.90	3.72	89 (18.94%)	53 (60.20%)
	2. Middle-age	44.26	6.13	192 (40.85%)	90 (47.40%)
	3. Old	60.62	5.11	115 (24.47%)	65 (56.50%)
Portuguese	1. Young	21.79	3.37	33 (7.02%)	16 (53.30%)
	2. Middle-age	46.50	5.93	22 (4.68%)	12 (53.30%)
	3. Old	59.29	3.79	14 (2.98%)	6 (46.20%)
Total		44.34	13.56	470 (100%)	242 (51.49%)

adults (192) from 36 to 54 years; and old adults (115) 55 years and older. The age of Portuguese participants ($n = 69$) ranged from 18 to 66 years: Young adults (33) from 18 to 34 years; middle-age adults (22) from 36 to 54 years; and old adults (14) from 55 and older. Concerning labor satisfaction, we could observe that 52.50% from German participants and 49.27% of Portuguese participants are satisfied with their work during the pandemics period. Regarding academic qualifications of German participants, 52.9% had a graduation degree, 15.7% a bachelor degree, 13.5% a technical education degree, 11.2% a secondary education degree and 4.7% a Ph.D. degree. In Portugal, 46.4% had a graduation degree, 27.5% a secondary education degree, 17.4% a master's degree, 2.9% a technical education degree and 1.4% a Ph.D. degree.

Measurement Tools

The main research tool is the Health Cube—Survey—Corona Virus COVID19 (HCSCV-19). The survey comprises questions related to mental health and well-being in several domains of daily life. For the purposes of this study, only a part of the questions have been analyzed, namely, those related to quality of life, trait anxiety, Coronavirus threat, optimism regarding the pandemics, difficulty to relax, life satisfaction, empathy, and pro-social attitude, well-being, and sleep quality during the pandemics period. The Portuguese version has been made by the authors, adapting the original German text to the Portuguese linguistic and cultural context, in order to preserve semantic equivalence in accordance with the ITC Guidelines (Bartram and Hambleton, 2016; Bartram et al., 2018).

The selected part includes:

1. A socio-demographic survey created for this research.
2. Quality of Life was assessed using the mean of 14 items semantic differential scale (also known as a polarity, polarity profile, or impression differential). The sum of the responses was used as a measure of the variable. The short version of the scale was chosen because it measures some features of the long form of the questionnaire more economically. The original version of the semantic differential was developed by Osgood et al. (1957) and is used to assess personality attitudes. Participants are given adjectives to differentiate using bipolar scales. The reliability of the scale in the current study was assessed using Cronbach's alpha (0.90).

Example of items:

- How do you evaluate your life in the current situation?
- 1. Frightening 7. Fearless;
- How do you evaluate your life in the current situation?
- 1. Insecure 7. Self-confident.
- 3. Trait anxiety was measured with the Trait Anxiety Scale (Krohne, 1996), a self-report scale with 10 items (the sum of the responses was used as a measure of the variable). Trait anxiety is a tendency relatively stable at an intraindividual level, but it shows the interindividual propensity to perceive living situations as threatening and to react to them with an augmented state of anxiety. This tool describes how he

or she feels at "this very moment" in relation to 26 items presented on a 4-point Likert intensity scale: 1 = "not at all," 2 = "somewhat," 3 = "moderately," 4 = "very much. The reliability of the scale was assessed using Cronbach's alpha (0.86). Example of items: "I feel frightened".

4. The valid and reliable instruments of Bidzan-Bluma et al. (2020), have been modified and adapted to develop measures for life satisfaction and Coronavirus threat, optimism regarding the pandemics, difficulty to relax, empathy, and pro-social attitude, and sleep quality during the pandemics period, on a 4-point Likert intensity scale: 1 = "not at all," 2 = "somewhat," 3 = "moderately," 4 = "very much." The total score from each one of the scales is calculated by summing the scores obtained in each of the sub-groups of items from each of the measures. Participants were asked to assess the strength of their fears about COVID-19 in relation to:
 - (a) Coronavirus threat, using a single scale with 3 items, with a good reliability of the scale using Cronbach's alpha (0.71). Example of item: "Do you experience the situation regarding the Coronavirus as a threat?" (1 = "not at all," 2 = "somewhat," 3 = "moderately," 4 = "very much").
 - (b) Optimism regarding the pandemics, using 3 items, with a good reliability of the scale using Cronbach's alpha (0.81). Example of item: "Are you optimistic regarding a solution?" (1 = "not at all," 2 = "somewhat," 3 = "moderately," 4 = "very much").
 - (c) Sleep quality, using 3 items, with a good reliability of the scale using Cronbach's alpha (0.81). Example of item - "I had trouble sleeping" (1 = "not at all," 2 = "somewhat," 3 = "moderately," 4 = "very much").
 - (d) Difficulty to relax, using 15 items, with a good reliability of the scale using Cronbach's alpha (0.91). Example of item: "I felt irritable and angry" (1 = "not at all," 2 = "somewhat," 3 = "moderately," 4 = "very much").
 - (e) Health care, using 7 items, with a good reliability of the scale using Cronbach's alpha (0.71). Example of item—"I'm more careful about washing my hands" (1 = "not at all," 2 = "somewhat," 3 = "moderately," 4 = "very much").
 - (f) Empathy and pro-social attitude, using 13 items, with a good reliability of the scale using Cronbach's alpha (0.78). Example of items: "In comparison to before the Coronavirus outbreak, I feel like I'm doing something for society"; "In comparison to before the Coronavirus outbreak, I am more concerned about my partnership/family" (1 = "not at all," 2 = "somewhat," 3 = "moderately," 4 = "very much").
5. General well-being was measured using ten items taken from the Well-being Manifestations Measure Scale (adaptation by Monteiro et al., 2012, of the original EMBEPP by Massé et al., 1998), ranging from none of the time to all of the time, rated on a 5-point Likert-type intensity scale. The total score of psychological well-being is calculated by summing the scores obtained in the ten items, ranging from zero (0) to fifty (50). The reliability of the scale was assessed using Cronbach's alpha (0.87). Example of items: "I feel happy".

Procedure

As mentioned, this work is part of a larger project entitled: Health Cube—Survey—Corona Virus COVID19, coordinate by DPFA-Academy of Work and Health and reviewed and approved by the Ethical Committee of University of Gdańsk (decision 30/2020).

The present e-survey follows the recommendations for Improving the Quality of Web Surveys, based in the Checklist for Reporting Results of Internet E-Surveys (CHERRIES) (Eysenbach, 2012).

The preparation of the e-survey was preceded by an introduction explaining the identity of the research team, institutional contacts, the purpose of the study, the guarantee of anonymity, confidentiality, and data use only for scientific purposes. After the informed consent were made, the HCSCV-19 has been applied in a single and individual, 45-min online session, by a member of the project team to a group of master degree students ($N = 10$), in order to analyze the usability and functionality of the electronic survey in Google docs.

The final e-survey was disseminated through email and social networks (Facebook, Moodle, WhatsApp, and Instagram and LinkedIn) from 15th April to 30th May in Portugal and Germany. In this tool, an information sheet and a consent form were available on the first page of the questionnaire in both languages. Participants were free to withdraw at any time without giving explanations and no personal identification was requested to guarantee confidentiality. Participants were given no incentives for answering the questionnaire. The system of Google Forms only provides responses for questionnaires with a 100% completion rate. The responses were downloaded as an Excel file and securely stored using a protected database. The present study followed the ethical code for web-based research (Franzke et al., 2019) and conforms to the principles embodied in the Declaration of Helsinki of the World Medical Association (WMA, 2013).

To create the data base, each one of the questionnaires received by the Google docs platform was downloaded and transformed into SPSS Statistics data file (version 24). The data analysis was carried on with software for data processing SPSS (Statistical Package for the Social Sciences).

RESULTS

The analyses of psychological adjustment, quality of life, well-being, and optimism in German and Portuguese population of adults during COVID-19 pandemics crisis were performed on the basis of descriptive statistics. First, the sample was divided in age groups, based on statistical and theoretical criteria to understand data across the lifespan. Three groups were defined: (1) young adults (18–34 years), (2) middle-age adults (36–54 years), and (3) old adults (55 years and older) (Table 1).

The means, standard deviations, and intercorrelations (Pearson's r or Spearman's ρ depending on the variable's scale) were then analyzed for the study variables on the entire sample. Differences between groups (country and age) were examined using an analysis of variance. To finish, with the aim to test the hypothesis regarding the predictors of psychological

adjustment, namely, quality of life, well-being, and sleep quality in German and Portuguese population of adults during COVID-19 pandemics crisis, a regression analyses were performed to better understand the predictors of well-being and quality of life during pandemics. Before running the regression analysis, we checked the predictors' multicollinearity using the Variance Inflation Factor (VIF).

Descriptive Statistics

The descriptive and correlations analysis (means, standard deviations, and intercorrelations (Pearson's r or Spearman's ρ depending on the variable scale) for the observed variables on the entire sample are shown in Table 2. It was observed that well-being and quality of life were positively correlated with empathy and pro-social attitude, optimism, sleep quality, Coronavirus threat; on the other hand, age and labour satisfaction were negatively correlated with trait anxiety and difficulty to relax. Sleep quality was positively correlated with quality of life, empathy and pro-social attitude, optimism, Coronavirus threat. And age, level of graduation and labour satisfaction were negatively correlated with trait anxiety, difficulty to relax, health care and empathy and pro-social attitude during the pandemics period.

Differences Between Groups

To investigate the differences between German and Portuguese groups of participants, an analysis of variance was performed (Table 3). This analysis shows a significant difference among people in Portugal and Germany with respect to anxiety as a trait, difficulty to relax, optimism, well-being, quality of life, health care, and empathy and pro-social attitude during the pandemics confinement. The means and standard deviation scores show that Portuguese participants express greater scores than German in quality of life, well-being, empathy, and pro-social attitude and health care, as well as in anxiety as a trait and difficulty to relax. But German participants express a better sleep quality.

The main differences between countries yielded an effect of size of 28% in the variable health care [$F(1, 346) = 138.226$, $p = 0.000$], of 12% in empathy and pro-social attitude [$F(1, 346) = 48.096$, $p = 0.000$], and of 6% in sleeping quality [$F(1, 346) = 22.784$, $p = 0.000$]. These data indicate a variability in perceived health care, empathic attitude, and sleeping quality in terms of the country. In Portugal people expresses higher empathic attitude and health care but in Germany people have higher quality of sleep.

A factorial Anova was conducted to compare the main effects of country and group of age, as well as, their interaction effects on the examined variables. A factorial Anova was chosen, because the restricted number of participants in one of our samples (Nachtigall et al., 2003) limits the use of other technics as structural analysis models, and with factorial Anova it is possible to observe the main effects of independent variables as well as its interaction, what could provide guidelines for further studies (Marôco, 2014; Tabachnick and Fidell, 2019).

Country and group of age effects were statistically significant for the examined variables (see Tables 3, 4, respectively). The multivariate result was significant for country [Roy's Largest

TABLE 2 | Descriptive statistics and intercorrelation matrix for the variables examined in the study.

Variables	M	SD	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	44.21	13.59	1											
2. Level of education	-	-	0.090	1										
3. Labor satisfaction	-	-	-0.016	-0.036	1									
4. Quality of life	63.35	13.03	0.202**	0.067	0.295**	1								
5. Corona threat	14.69	3.73	0.209**	0.037	0.247**	0.761**	1							
6. Optimism	9.56	2.81	0.191**	0.047	0.325**	0.748**	0.704**	1						
7. Health care	18.90	4.45	-0.076	0.039	0.022	0.047	-0.072	-0.036	1					
8. Pro-social attitude	35.14	5.30	-0.009	0.056	0.032	0.175**	0.061	0.059	0.502**	1				
9. Difficulty to relax	28.85	8.99	-0.152**	-0.082	-0.204**	-0.329**	-0.438**	-0.450**	0.327**	0.228**	1			
10. Sleep quality	10.14	2.24	0.101*	0.069	0.155**	0.271**	0.364**	0.366**	-0.243**	-0.136**	-0.682**	1		
11. Trait anxiety	22.78	8.06	-0.219**	-0.056	-0.249**	-0.438**	-0.541**	-0.516**	0.247**	0.142**	0.691**	-0.575**	1	
12. Well-being	36.07	6.42	0.119*	0.081	0.112*	0.426**	0.479**	0.319**	0.167**	0.255**	-0.222**	0.177**	-0.364**	1

*Correlation is significant at the 0.05 level (2-tailed).

**Correlation is significant at the 0.01 level (2-tailed).

Root = 0.68, $F = 25.66$, $df = (1,346)$, $p = 0.000$], indicating a difference in the variables examined by country. The results were also significant by group of age [Roy's Largest Root = 0.07, $F = 2.45$, $df = (2,346)$, $p = 0.000$]. Finally, the results were not significant for the interaction between country and group of age [Roy's Largest Root = 0.04, $F = 1.48$, $df = (2,346)$, $p = 0.000$], indicating that there are no combined effects between country and group of age (see **Figure 1**).

FIGThe analysis of differences in the examined variables by group of age shows a significant difference among people in different age groups with respect to anxiety as a trait, difficulty to relax, optimism, well-being, and quality of life during the pandemic's confinement. The means and standard deviation scores based on the Tukey multiple comparisons test show that old adults scored lower than young adults and middle-age adults in anxiety (mean difference = -4.13 , $SE = -6.60$, $p < 0.01$; mean difference = -2.27 , $SE = -4.51$, $p < 0.01$, respectively), and higher than young adults and middle age adults in quality of life (mean difference = 8.42 , $SE = 1.55$, $p < 0.01$; mean difference = 5.42 , $SE = 1.71$, $p < 0.01$, respectively), as well as in Coronavirus threat (mean difference = -2.16 , $SE = 0.52$, $p < 0.01$; mean difference = 1.52 , $SE = 0.47$, $p < 0.05$, respectively). Old adults scored lower than young adults (mean difference = -3.66 , $SE = 1.20$, $p < 0.05$) in difficulty to relax during the pandemics period, and higher than young adults (mean difference = 1.23 , $SE = 0.31$, $p < 0.01$) and middle-aged adults (mean difference = 0.92 , $SE = 0.30$, $p < 0.05$) in optimism during the pandemics period, as well as higher than young adults (mean difference = 2.13 , $SE = 0.18$, $p < 0.05$) in well-being. The main effect of age group was a difference of 5,1% in the variable quality of life [$F(3, 344) = 9.281$, $p = 0.000$], suggesting that 5% of variance in quality of life perceived by participants was explained by age or experience in life.

In the next stage, the predictive power of independent variables was examined, i.e., perceived threat of Coronavirus, optimism regarding the pandemics, difficulty to relax, life satisfaction, health care, empathy, and pro-social attitude and quality of sleep, age, as well as country, and level of education and labour satisfaction relative to dependent variables, namely, well-being and quality of life. A multiple linear regression analysis of variance was performed to understand the impact of the independent variables in dependent variables. First, the residual independence using the Durbin-Watson analysis was examined. The homoscedasticity was investigated, analyzing the plots of residues vs. non-standard predicted values. The absence of multicollinearity was evaluated, taking into account values higher than 0.2. The existence of outliers and tested high scores was analyzed, eliminating studentized residuals greater than ± 3 standard deviations, values greater than 2 and values above 1 for Cook's distance. Thus, two separate multiple regression analyses were run. For estimating regression coefficients and standard errors, the bootstrap procedure was applied with 1,000 samples. **Table 5** shows a summary of the outcomes of these analyses. The analysis of the results obtained demonstrated a significant effect of corona threat in well-being and quality of life [$B = 29.83$, $SE = 3.26$, $\beta = 0.45$, $p < 0.01$; $B = 27.53$, $SE = 5.90$, $\beta = 0.67$, $p < 0.01$, respectively],

TABLE 3 | Differences in groups by country.

Variables	Country		<i>F</i>	<i>p</i>	Eta ²
	Portugal <i>M</i> (<i>SD</i>)	Germany <i>M</i> (<i>SD</i>)			
Quality of life	67.69 (11.80)	62.88 (12.80)	7.038	0.008**	0.019
Corona threat	14.86 (2.64)	14.74 (3.79)	0.007	0.932	0.000
Optimism	9.06 (2.70)	9.70 (2.74)	3.201	0.074	0.009
Health care	24.23 (3.12)	17.96 (3.94)	138.226	0.001*	0.281
Pro-social attitude	39.18 (4.13)	34.39 (5.12)	48.096	0.001*	0.120
Difficulty to relax	33.75 (6.96)	27.80 (8.71)	25.131	0.001*	0.066
Sleep quality	9.00 (2.34)	10.37 (2.09)	22.784	0.001*	0.060
Trait anxiety	26.23 (7.93)	21.89 (7.36)	20.816	0.001*	0.056
Well-being	41.28 (5.66)	35.30 (5.97)	53.059	0.001*	0.130

N = 456; *df* = 1.

p* ≤ 0.05, *p* ≤ 0.001.

TABLE 4 | Differences in group of age.

Variables	Group of age			<i>F</i>	<i>p</i>	Eta ²	Post hoc Tukey Test
	1. Young <i>M</i> (<i>SD</i>)	2. Middle <i>M</i> (<i>SD</i>)	3. Old <i>M</i> (<i>SD</i>)				
Quality of life	60.39 (11.70)	63.39 (12.50)	68.81 (11.76)	9.281	0.001**	0.051	G3>G1** G3>G2**
Corona threat	13.94 (3.68)	14.58 (3.89)	16.11 (3.15)	4.071	0.018*	0.023	G3>G1** G3>G2**
Optimism	8.89 (2.71)	9.56 (2.80)	10.40 (2.49)	3.281	0.039*	0.019	G3>G1** G3>G2*
Health care	19.84 (4.59)	18.61 (4.55)	19.54 (4.31)	0.267	0.766	0.002	G1>G2*
Pro-social attitude	35.24 (5.40)	35.07 (5.30)	36.01 (4.80)	0.489	0.614	0.003	–
Difficulty to relax	30.82 (8.80)	29.04 (8.83)	27.16 (8.07)	2.958	0.053	0.017	G1>G2*
Sleep quality	9.89 (2.42)	10.15 (2.14)	10.35 (2.01)	1.703	0.184	0.010	–
Trait anxiety	24.34 (8.22)	22.49 (7.62)	20.21 (6.23)	3.680	0.026*	0.021	G1>G3** G1>G2*
Well-being	35.70 (7.53)	36.22 (6.06)	37.83 (4.96)	3.250	0.040*	0.018	G3>G1*

N = 456; *df* = 2.

p* ≤ 0.05, *p* ≤ 0.001.

during the pandemics period. Optimism also appears as a significant and positive predictor of well-being, and anxiety as a trait presents a significant and negative effect. Optimism, health care and age seem to be significant predictors of quality of life.

DISCUSSION

Quality of life and well-being during pandemics seem to differ in terms of contextual variables (country) and group of age. In the current investigation, Portuguese people rated well-being, quality of life, health care and empathy and pro-social attitude better than German people, but Portuguese also express higher levels of anxiety as a trait, difficulty to relax, and difficulties to sleep. Germans declare to experience better quality of sleep, lower anxiety, and lower difficulties to relax, but this does not seem to foster a better perception of quality of life and well-being. These data suggest that the concern of Portuguese adults for others, shown through empathy and pro-social attitudes, gives a sense to confinement in terms of being useful for themselves and for others, also promoting a higher appreciation of health care behavior and a higher perception of positive well-being, a fact that

coincides with the results obtained in previous studies (Haramati, 2015; Vinayak and Judge, 2018).

Concerning quality of life and well-being during pandemics, these results seem to indicate, surprisingly, that old adults express higher quality of life, higher optimism, higher well-being, as well as less concern on Corona threat than young adults. Previous studies showed that old people present in general lower levels of quality of life (see for example, Gwozdz and Sousa-Poza, 2010; Huong et al., 2017). It must be mentioned that the current data were collected with a sample, where between 65% (in Germany) and 73% (in Portugal) of participants had high academic qualification and high labor satisfaction (bachelor, graduation, master's degree, and PhD), a difference in comparison to the study of Bidzan-Bluma et al. (2020). Therefore, it seems that higher levels of quality of life and well-being in old adults are associated with socioeconomic security provided by labor or retirement conditions. On the other hand, these results indicate that young participants show more anxiety as a trait, more difficulty to relax and higher health care (using masks, maintaining social distancing, and washing frequently the hands), suggesting that, during COVID-19 pandemics crisis, young adults show a lower psychological adjustment associated to lower levels of quality of life, well-being,

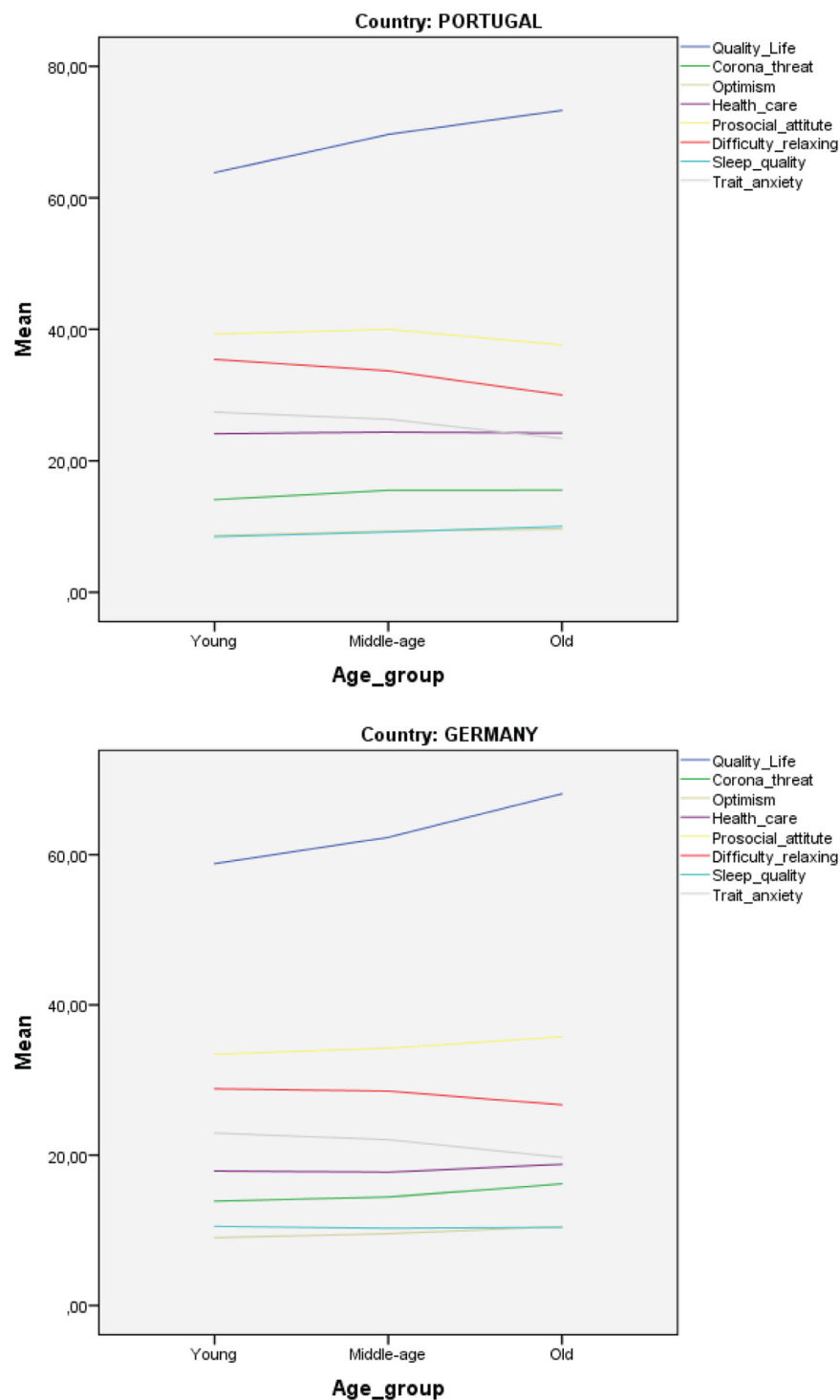


FIGURE 1 | Differences by country and group of age.

quality of sleep, and optimism than other age groups, a fact that has been observed in other recent studies on the psychological adjustment during pandemic (Lin et al., 2020). One more possible explanation for these results is the fact, found by Pirchio et al.

(2021), that the lack of contact with nature seems to affect especially young people.

The results from this study suggest that wellbeing is affected by the concern with the risk of being infected. The concept

TABLE 5 | Summary of results of multiple regression analyses.

Predictors	Well-being		Quality life	
	B [95% CI]	SE	B [95% CI]	SE
Corona threat	29.83** (23.40; 36.16)	3.26	27.53** (16.03; 39.77)	5.90
Optimism	0.66** (0.42; 0.94)	0.13	1.46** (1.10; 1.87)	0.20
Health care	−0.04 (−0.35; 0.27)	0.16	1.67** (1.16; 2.21)	0.26
Pro-social attitude	0.14 (−0.02; 0.29)	0.08	−0.01 (−0.23; 0.22)	0.12
Difficulty to relax	0.20** (0.08; 0.32)	0.06	0.16 (−0.04; 0.37)	0.10
Sleep quality	0.04 (−0.06; 0.12)	0.05	0.04 (−0.12; 0.16)	0.07
Trait anxiety	−0.26** (−0.37; 0.15)	0.06	0.01 (−0.24; 0.10)	0.09
Age	0.01 (−0.03; 0.04)	0.02	0.07* (0.01; 0.13)	0.03
Country	−5.06** (−6.54; −3.53)	0.76	−5.66** (−8.05; −3.28)	1.22
Level of education	0.25 (0.08; 0.61)	0.18	0.10 (−0.55; 0.71)	0.31
Labor satisfaction	−0.57 (−1.67; 0.53)	0.54	1.63 (−0.10; 3.39)	0.85
Adjusted R²	0.45		0.67	

The bold value indicates, **B**, unstandardized regression coefficient; **CI**, confidence interval; **SE**, standard error. *N* = 352, **p* < 0.05, ***p* < 0.01, bootstrap results are based on 1,000.

of perception of the risk (i.e., beliefs, knowledge, values, and attitudes that can influence decisions and behaviors) has become increasingly relevant in research about the current pandemics, as Repišti et al. (2020) refer, creating conditions of psychological vulnerability and mental health risk (Holmes et al., 2020). The current findings are in accordance with other studies that demonstrate a lower quality of life during pandemics, because lockdown produces a sudden change in people's life, creating a sense of undefinedness about the future and the worry about health, as well as limitations in social life (Epifanio et al., 2021). Surprisingly, in the current study age seems to be a predictor of quality of life. One is tempted to believe that a greater experience of life, a higher economic stability and higher labour satisfaction are protective factors of quality of life. Finally, a personality characteristic like optimism seems to be an important predictor of quality of life and well-being and consequently, a predictor of the psychological strength to adjust to all barriers created by Corona pandemics, as Pellerin and Raufaste (2020) also demonstrated with a study conducted in France during the lockdown of April 2020.

Regarding the limitations of this study, the first one is the difference between the samples collected in Germany and in Portugal, the latter being significantly smaller. Secondly, the study was conducted in digital and online format, so that people who did not have access to these means could not participate. On the other hand, given that this is a cross-sectional study, carried out at a certain point in time, it does not allow a comparison between the pre-pandemics period and the period during the pandemics, nor of the effects of the parasite factors (socioeconomic level, health and isolation) in the sample.

Finally, the fact that this is a recent phenomenon makes difficult a comparison with other studies and, in terms of results, it is presently impossible to assess the long-term impact of this pandemics on the various dimensions under study. Future research will be certainly necessary, given the impact of the pandemics. Qualitative and quantitative studies should be done to compare the psychological effects of the

pandemics and of each one of the different measures applied by the governments to control the disaster (like social isolation, quarantine, etc.), on different populations and in different countries. It is also important to explore individual differences in coping strategies before the disaster, to develop differential intervention strategies to give psychological support to the affected populations.

CONCLUSION

Worldwide, there has been great concern on the effects of the COVID-19 pandemics on the mental health of the population, along with a difficulty in assessing its impact at a more holistic level, due to the individual differences in psychological processes, environment, level of health and SES, leaving to different individual responses to the economic and isolation restrictions applied by the government in every country. This study explores some individual differences concerning the response to the crisis, mainly in terms of the age and nationality, namely, between German and Portuguese adults of three different age groups.

In this study, a higher score in quality of life, optimism and well-being was observed in old adults compared to young and middle-age adults. In the young adults' group, higher levels of trait anxiety and difficulty to relax were observed in comparison to the other groups.

Regarding the participants' nationality, Portuguese participants showed higher scores than German participants in quality of life, well-being, empathy and pro-social attitude, and health care, as well as in trait anxiety and difficulty to relax. On the other hand, the German participants expressed a better sleep quality than Portuguese participants. Such results could be interpreted as indicators of profound differences in psychological adjustment to COVID-19 challenges, in different groups of age and in different countries, that should be carefully studied in other countries with more robust samples. Possibly, the measures of social isolation and lockdown

applied differently in each country could have impact on psychological adjustment. Portugal is a small country, with central rules for all population, and Germany has applied more varied and flexible rules for different regions. Centralized and well-defined rules seem to correlate with more sense of quality of life, more empathy and more pro-social attitude. These psychological factors could correlate with the fact that centralized measures seem to produce quicker and better results. These possibilities need to be more deeply explored in other countries, with more strong samples.

The present study shows the crucial importance of the protection of mental health during pandemics, in order to moderate the effects of the perceived threat against the personal and social security, especially in the case of young participants, who show a higher psychological vulnerability than other age groups during the COVID-19 pandemics crisis, independently of the country. Finally, quality of life and well-being are influenced negatively by Corona threat, but optimism seems to be a protective factor, suggesting the importance of cultivating a positive perspective in order to cope better with the disaster.

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DATA AVAILABILITY STATEMENT

The raw data supporting the conclusions of this article will be made available by the authors, without undue reservation.

ETHICS STATEMENT

The studies involving human participants were reviewed and approved by the Ethic Committee from DPFA, Germany. The patients/participants provided their written informed consent to participate in this study.

AUTHOR CONTRIBUTIONS

AC, EG, and MS: conceptualization, methodology, and supervision. EG and AC: formal analysis. AC, EG, AP, and JK: investigation. EG, AP, and JK: writing–review and editing. All authors contributed to the article and approved the submitted version.

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Effects of Psychological Discomfort on Social Networking Site (SNS) Usage Intensity During COVID-19

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To cope with the COVID-19 pandemic, many countries are implementing social measures. Social distancing, working from home, and non-face-to-face lectures have led to major changes in people's activities. Since face-to-face classes are restricted, students in higher education become to feel psychological and cognitive discomforts such as isolation and risk perception. The purpose of this study is to explore the effects of psychological discomforts on the social network site (SNS) usage intensity of University students. Using structural equation modeling (SEM), this study applied SmartPLS 3.3.9 to analyze 271 valid samples. The results show that the affective risk perception significantly affects social distancing attitude. Cognitive risk perception is positively related to social distancing intention. In addition, cabin fever syndrome influences SNS usage intensity, affective risk perception, and cognitive risk perception. In conclusion, psychological discomfort partially affects the intensity of SNS use. Therefore, the government should set policies by reflecting citizens' mental difficulties and SNS activities together. Moreover, companies are needed to carefully consider the risk of the sense of isolation when marketing to SNS users.

Keywords: COVID-19, social networking site, SNS, social distancing, risk perception, cabin fever syndrome, information technology

INTRODUCTION

Since the COVID-19 outbreak, governments around the world have suggested that people stay at home and reduce their outdoor activities (Yarimkaya and Esentürk, 2020). Citizens are participating in preventive measures such as social distancing, mask wearing, working from home, and non-face-to-face learning. As social distancing and lockdown continue, people have been interacting with the outside world by using social network sites (SNSs) more actively (Nabity-Grover et al., 2020). According to statistics, the global usage of SNS, including Facebook, Instagram, and WhatsApp, has drastically increased (Holmes, 2020; Vall-Roqué et al., 2021). SNS has been found to facilitate the healthy behavior of residents, which in turn reduce negative mood and social distancing aroused from social isolation (Qin et al., 2020). In particular, SNS plays a vital role in young individuals' lives (Gioia et al., 2020; Vall-Roqué et al., 2021). Therefore, it would be meaningful to pay attention to the SNS activities of University students, a young group whose external activities have been restricted by social measures.

Social distancing helps to decrease pressure on health services and hampers the spread of COVID-19 (Koo et al., 2020). It is the most effective way to block the virus and prevent infection (Adiyoso and Wilopo, 2020). People make decisions based on social distancing steps noticed on media. The greater the attitude and intention toward social distancing, the fewer outdoor activities, which would affect the use of SNS. Thus, this study posits that social distancing attitude and social distancing intention are vital components that lead to SNS usage intensity.

The emergence of COVID-19 and corresponding social distancing have created derivative psychological discomfort, respectively. First, COVID-19 itself makes people aware of risks such as infection and death (Dryhurst et al., 2020). Traumatic stress and fear may be included in the psychological impact caused by COVID-19 (Chakraborty et al., 2020). Fear means worrying about getting affected by COVID-19 (Wang et al., 2020). Risk perception in the COVID-19 situation also measures anxiety about the infection or death (Ju and You, 2022). Psychological risk occurs with mental discomfort. It represents the effects of COVID-19 (Chua et al., 2021). Since psychological impact generally involves mental discomfort and the notion of risk perception under the COVID-19, this study considers risk perception as a component of psychological discomfort. Second, social distancing/lockdown limits citizens' outside activities and increases isolation time (Van Orden et al., 2021). It causes cabin fever syndrome (Estacio et al., 2020). Cabin fever refers to mental discomfort experienced in confined spaces for a long period (Crawford and Crawford, 2021). In particular, social lockdown gives children and young people the psychological stress of cabin fever (Crawford and Crawford, 2021). In summary, COVID-19 itself causes people mental discomfort of risk perception, and social measures cause cabin fever syndrome. Therefore, this research considers risk perception and cabin fever as factors of psychological discomfort.

As the development of COVID-19 proceeds globally, it is becoming increasingly significant to figure out public risk perception (Van Bavel et al., 2020). Risk perception is significant in determining health-protective behavior (Savadori and Lauriola, 2021). Higher perceived risk can elevate an individual's adherence to protective actions (Brewer et al., 2007). In this vein, people with a higher level of risk perception for COVID-19 might regard social distancing as more beneficial and form a greater degree of behavioral intention. Risk perception is measured based on two dimensions, affective and cognitive (Brug et al., 2004). Therefore, this study investigates the role of affective risk perception and cognitive risk perception in capturing SNS users' attitudes and intentions toward social distancing.

Cabin fever syndrome is described as a common reaction when people are confined in a space for a long time (Seitz, 2019). Hoof (2020) stated that COVID-19 lockdown might result in a secondary epidemic of mental stress and listlessness. In the context of the pandemic, quarantined individuals would experience cabin fever syndrome because of stress due to social distancing (Chakraborty et al., 2020). People with higher cabin fever syndrome may increase SNS usage to address the sense of isolation and closure. They also might have a higher perception of the COVID-19 risk. Hence, this study posits cabin fever

syndrome as the predominant factor in forming SNS usage intensity, affective risk perception, and cognitive risk perception.

Some previous studies have analyzed the factors affecting the educational outcome of University students in the COVID-19 environment in various ways. Chen et al. (2022) demonstrated the antecedents of English language learning outcomes during COVID-19. The authors revealed that self-concept and self-efficiency are the vital factors influencing the results of University students. Iqbal et al. (2021) suggested the research model identifying the key determinants of cognitive outcomes of University students. They showed that self-awareness, empathy, motivation, and social skills had a significant effect on relational engagement. In addition, relational engagement was figured to be a significant leading variable of cognitive outcomes. At the same time, Iqbal et al. (2022) clarified the factors affecting the study habits of University students. They pointed out that study habits were influenced by self-awareness, self-motivation, regulation of emotions, and cognitive engagement.

The aforementioned studies did not reflect the psychological factors of University students due to the COVID-19. COVID-19 has changed the psychological state of the students, and it may have affected their social media activities. Therefore, this paper aims to investigate the effect of mental difficulties on the intensity of SNS use to bridge this gap.

The next section presents a review of the related work and the research model. Afterward, research methodology and data information are covered in section research methodology. Section research results shows the findings of the study. Moreover, Section discussion describes the discussion. Finally, section conclusion details the theoretical and practical implications of the research, followed by limitations and future research directions.

THEORETICAL BACKGROUND AND HYPOTHESES DEVELOPMENT

Theoretical Background

Numerous studies have investigated the roles, impacts, and human behaviors of SNS since the COVID-19 outbreaks (Chang et al., 2020; Yoneoka et al., 2020; Zuo et al., 2020; Vall-Roqué et al., 2021). Zuo et al. (2020) verified that sharing physical activity experiences on SNS significantly affects social connectedness, positive self-presentation, and positive feedback during pandemics. It is also found that positive self-presentation significantly influences positive feedback. Vall-Roqué et al. (2021) examined the role of COVID-19 lockdown in deriving SNS use, low self-esteem, and body image disturbances. SNS use significantly influences body dissatisfaction, drive for thinness, and low self-esteem in the younger age group (14–24 years). Qin et al. (2020) argued that SNS enhances the relationship between people and society. Chang et al. (2020) clarified the factors that affect the COVID-19 pandemic compliance intention in the case of the citizens who have been quarantined or subjected to restricted mobility to prevent COVID-19. Active sharing of information through SNS during the pandemic was validated to enhance self-efficacy and perceived avoidability, resulting in

positive thinking. Yoneoka et al. (2020) revealed a positive association between the number of COVID-19 cases and self-reported fevers of SNS users, implying that massive monitoring would help to capture the scale of the COVID-19 catastrophe.

Social distancing is the most representative and effective social measure for COVID-19 prevention. Several scholars have studied the attitudes, intentions, and behaviors toward social distancing. Hagger et al. (2020) proposed an extended social cognition model to examine the predictors of social distancing intention and behavior during COVID-19. They found that subjective norm, moral norm, and perceived behavioral control (PBC) are consistent predictors of social distancing intention. Adiyoso and Wilopo (2020) verified the significance of risk perception on social distancing attitudes in the context of COVID-19. They revealed that risk perception influences perceived behavioral control stronger in younger individuals than older people. Kawashima et al. (2021) examined the telework implementation and fever rate as a social distancing measure using the data gathered from SNS users. Company employees in the non-teleworker group showed statistically higher fever rates than the telework group.

Several works have shown that disaster preparedness and health behavior are determined by risk perception (Adiyoso and Kanegae, 2013; Bae and Chang, 2021; Savadori and Lauriola, 2021). A great deal of work on psychometrics has asserted that there are two fundamental procedures in which people perceive risk (Epstein, 1994; Sjöberg, 1998; Finucane et al., 2000; Slovic et al., 2004; Trumbo et al., 2016). Sjöberg (1998) noted that affective risk perception refers to an individual's anxiety about exposure to a particular risk. He also described cognitive risk perception as a person's perceived susceptibility to risks. Slovic et al. (2004) stated that risk as feelings represents a person's instinctive reactions to threat and risk as analysis is based on reason, logic, and deliberative processes. Affective risk perception is similar to risk as feeling and cognitive risk perception seems like risk as analysis. Risk perception has proven to have a positive correlation with behavioral intention (Floyd et al., 2004). Savadori and Lauriola (2021) investigated the relationship between risk perception and protective behaviors during the COVID-19 crisis. They uncovered that both feelings of risk and risk analysis are significantly associated with social distancing behavior. Bae and Chang (2021) validated the impact of COVID-19 risk perception on behavioral intention toward preventive tourism. They figured out that both affective risk perception and cognitive risk perception affect significant behavioral intention.

Cabin fever describes the stressful temper combined with inertia when a person experiences confinement over a long period (Fritscher, 2020a). People got restless, irritable, and lonely when they are in lack of social interaction and isolation (Hartwell-Walker, 2020). The COVID-19 pandemic might cause cabin fever syndrome because movement and socialization are being restricted. Several studies showed that the COVID-19 outbreak and its associated quarantine would be related to anxiety, depression, disturbed sleep, and post-traumatic stress disorder (Liang et al., 2020; Rajkumar, 2020). Estacio et al. (2020) validated the impacts of the implementation of community isolation on cabin fever syndrome. They found that majority

of the participants experience manifestations of cabin fever. It was also observed that the female has difficulty in concentrating and sudden food cravings. Chakraborty et al. (2020) explored the psychological impact on SNS usage intensity by modifying cognitive dissonance theory. They developed the psychological impact as the second-order construct by combining cabin fever syndrome, loneliness, COVID-19 fear, and traumatic stress. The psychological impact was found to have significance on SNS usage intensity in the 21–35 years group and the students learning online group.

A number of research on SNS have explored the role of demographic variables such as gender, age, and income in explaining SNS behavior (Ji et al., 2014; Kim and Yoo, 2016; Vall-Roqué et al., 2021). Kim and Yoo (2016) examined the impacts of using SNS. The authors identified the effects of age and gender differences in those impacts. They found that there are significant differences along with age and gender in the effects of SNS usage. Ji et al. (2014) clarified social networking behaviors among younger and older adolescents regarding age, gender, and personality. They found that their latent utilization, socializing, and privacy disclosure SNS behaviors were influenced by age, gender, and personality. Asghar et al. (2022) analyzed social media tools for the development of pre-service health science researchers during COVID-19. They demonstrated that communication and multimedia significantly affect research completeness.

Research Model and Hypotheses

Figure 1 depicts the theoretical framework for investigating the key factors of SNS usage intensity. This study posits that social distancing attitude, social distancing intention, affective risk perception, cognitive risk perception, and cabin fever syndrome as determinants that develop SNS usage intensity. As demographic factors have been employed in explaining user behaviors toward information system usage (Venkatesh et al., 2003) and SNS (Vall-Roqué et al., 2021), this article reflects gender and age as control variables in the conceptual model. The final research model is shown in **Figure 1**.

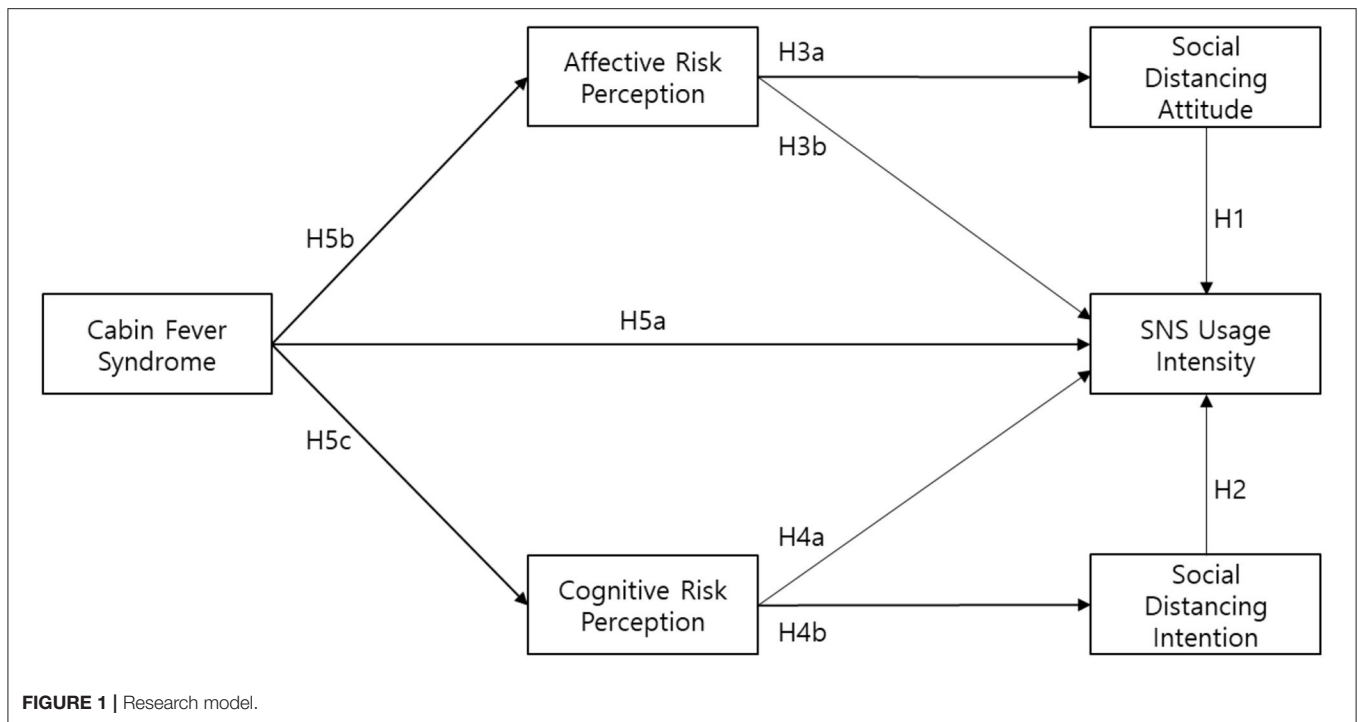
Social Distancing Attitude

Social distancing attitude represents the attitude people hold concerning complying with social distancing among people, as a means to inhibit COVID-19 infection (Williams et al., 2015; Fong et al., 2020). The stronger the attitude toward social distancing SNS users have, the more likely they would be to stay in the allowed space compared to those who do not. Since SNS can be accessed easily with a computer or smartphone, it can be used easily even at home or in an isolated location. The greater the degree of attitude toward social distancing, the more likely they might be to use SNS more actively. Therefore, one can expect that social distancing attitude has an impact on SNS usage intensity.

Hypothesis H1. Social distancing attitude significantly influences SNS usage intensity.

Social Distancing Intention

Social distancing intention refers to the degree to which people want to practice social distancing to prevent COVID-19 infection



(Williams et al., 2015; Fong et al., 2020). CAVSD (Cognitive appraisal of voluntary social distancing compliance), which consists of social distancing attitude and social distancing intention, serves as the key factor of SNS usage intensity in the age group under 21 years (Chakraborty et al., 2020). In some cases, attitude and intention for social distancing are not mutually significant (Adiyoso and Wilopo, 2020). Therefore, it is necessary to identify the roles of social distancing attitude and social distancing intention separately. The greater the intention of social distancing citizens hold, the more likely they are to avoid going out or contacting others. Since SNS is a representative channel that enables communication and social exchange with others even when isolated, the people who have more intention of social distancing would raise the degree of SNS usage intensity. Thus, social distancing intention is expected to be a dominant factor in elevating the level of SNS usage intensity.

Hypothesis H2. Social distancing intention significantly influences SNS usage intensity.

Affective Risk Perception

Affective risk perception deals with the mood experienced when thinking about a hazard (Ferrer et al., 2018; Kaufman et al., 2019). It is the most powerful driver of protection motivation across a variety of hazards (Janssen et al., 2014). It has been found to determine the attitude toward preventive behavior in the context of COVID-19 (Bae and Chang, 2021). Feelings of risk, similar to affective risk perception, have a positive impact on social distancing (Savadori and Lauriola, 2021). SNS users with higher levels of affective perceptions of risk are likely to try to hinder infection. Thus, they judge that social distancing

is effective. They would also refrain from going out and avoid contact with others to participate in preventive measures. This leads to an increase in the use of SNS, a communication channel in the isolated space. Therefore, affective risk perception is believed to positively affect both SNS usage intensity and social distancing attitude.

Hypothesis H3a. Affective risk perception significantly influences SNS usage intensity.

Hypothesis H3b. Affective risk perception significantly influences social distancing attitude.

Cognitive Risk Perception

Cognitive risk perception refers to the degree of risk when a person thinks about a particular disaster or hazard (Trumbo et al., 2016). It has a significant impact on behavioral intention to hamper COVID-19 (Bae and Chang, 2021). Risk analysis, resembling cognitive risk perception, significantly affects social distancing behavior (Savadori and Lauriola, 2021). The intention to get vaccinated against diseases is stronger among people perceiving the probability of getting infected as higher (Brewer et al., 2007). As a consequence, recognizing the probability of a higher risk of COVID-19, SNS users would take part in social distancing more actively. They might also try to stay in isolated spaces, which will increase the frequency of SNS activities. Thus, it is expected that cognitive risk perception affects both SNS usage intensity and social distancing intention.

Hypothesis H4a. Cognitive risk perception significantly influences SNS usage intensity.

Hypothesis H4b. Cognitive risk perception significantly influences social distancing intention.

Cabin Fever Syndrome

Cabin fever syndrome is justified as a negative temper combined with claustrophobic lethargy when a person is caught in a quarantined space for a long period (Fritscher, 2020b; Robinson, 2020). In the context of COVID-19, there is no place to stay long except at home or work. People would feel frustrated and uncomfortable when they can not get out of a particular place for a long time (Hartwell-Walker, 2020; Rajkumar, 2020). The SNS users with greater cabin fever syndrome had higher perceptions of risk for COVID-19 because they would think that isolation is required due to COVID-19. In addition, the stronger the cabin fever syndrome, the harder they might communicate on SNS to relieve the feeling of isolation and closure they experience. Thus, this study expects that cabin fever syndrome plays a key role in forming SNS usage intensity, affective risk perception, and cognitive risk perception.

Hypothesis H5a. Cabin fever syndrome significantly influences SNS usage intensity.

Hypothesis H5b. Cabin fever syndrome significantly influences affective risk perception.

Hypothesis H5c. Cabin fever syndrome significantly influences cognitive risk perception.

RESEARCH METHODOLOGY

Instrument Development

All indicators corresponding to each factor within the research framework were selected from previously validated measures. The measurement items were modified to fit the case of SNS. Before the main survey was implemented, experts in the field of information systems and social science reviewed the questionnaire to assure logical order, wording, and question ambiguity. A pilot survey was performed to confirm the validity and reliability of the measures and to confirm their completeness. A total of 20 University students participated in the pilot test (Julious, 2005). The feedback was used to correct some indicators to ensure they were comprehensible to all the respondents. Each item was measured with a 7-point Likert scale, ranging between 1 ("strongly disagree") and 7 ("strongly agree"). **Table A** lists the survey items.

SNS Usage Intensity

The four statements related to the SNS usage intensity were adapted from Eid and Al-Jabri (2016). The examples of these items included "During social distancing/lockdown I am using social networking (SN) more than normal." and "During social distancing/lockdown I am logging into my SN sites more frequently."

Social Distancing Attitude

The three statements related to the social distancing attitude were adapted from Williams et al. (2015). The examples of these items included "In my opinion, the use of social distancing will have a positive impact to control COVID 19." and "The use of social distancing is beneficial for the care of the patients."

Social Distancing Intention

The three statements related to the social distancing intention were adapted from Williams et al. (2015). The examples of these items included "I have the intention to use social distancing when it becomes useful to avoid COVID 19." and "I have the intention to use social distancing when necessary to provide good results to avoid COVID-19."

Affective Risk Perception

The four statements related to the affective risk perception were adapted from Bae and Chang (2021) and Brug et al. (2004). The examples of four items included "I am worried that I will contract COVID-19." and "I am worried about my family members contracting COVID-19."

Cognitive Risk Perception

The four statements related to the cognitive risk perception were adapted from Bae and Chang (2021) and Brug et al. (2004). The examples of four items included "There is a high likelihood of acquiring COVID-19 in general." and "There is a high likelihood that I will acquire COVID 19 compared to other people."

Cabin Fever Syndrome

The four statements related to the social distancing intention were adapted from Fritscher (2020b) and Robinson (2020). The examples of four items included "I feel restless staying at home." and "I have trouble concentrating while staying at home during social distancing/lockdown."

Data Collection

The theoretical model was empirically verified by the use of data collected from the online survey. A survey was conducted for University students who had been using SNS during the COVID-19 pandemic. The participants were selected using a convenience sampling technique that has the advantage of being easily applied (Rasool et al., 2020). Students from four universities in Da Nang, Vietnam, received an online link to the survey. Vietnam was implementing social distancing during this period and University education was conducted entirely online (Vietnam Briefing, 2022). Therefore, it could be possible to accurately measure the risk perception and cabin fever syndrome of University students. The online questionnaire was distributed and collected from 16 September to 22 September 2021. Several professors helped collect data in their class. The purpose and aim of this study were explained on the first page of the questionnaire. This research informed that the collected data would be used only for academic purposes. Following the Statistics Act, participants were informed that their personal information of them would not be disclosed. The informed consent was specified on the same page. Only the consenting students voluntarily participated in the survey. Informants were provided an appropriate environment and time to think about fully the contents of the questionnaire and respond clearly. After discarding incomplete and aberrant responses, 271 responses were used for analysis. This research employed an a-priori sample size calculator to confirm the minimum requirement for

TABLE 1 | Sample characteristics.

Demographics	Item	Subjects (<i>N</i> = 271)	
		Frequency	Percentage
Gender	Male	116	42.8
	Female	155	57.2
Age	19 or younger	53	19.6
	20–23	171	63.1
	24 or older	47	17.3

structural equation models (DanielSoper.com)¹. Inputting the required information such as 0.1 anticipated effect size, 80% desired statistical power level, 6 number of latent variables, 22 number of observed variables, as well as 0.05 probability level, the minimum required sample size is 123. Since the sample size of this study is 271, this requirement is met as well. Among the final samples, 116 (42.8%) responses were male and 155 (57.2%) responses were female. The mean age of the final sample was 21.78 years with a standard deviation of 2.67. The demographic information of the final data is described in **Table 1**.

RESEARCH RESULTS

The data analysis was conducted using structural equation modeling (SEM). In SEM, there are two techniques, which are a variance-based technique and a covariance-based technique. This research used the partial least squares (PLS) method, a variance-based technique, because the research model has not been demonstrated in the literature (Hair et al., 2011). The PLS provides the advantage of suggesting fewer restrictions on the sample size and residuals compared to covariance-based techniques (Chin, 1998; Hair et al., 2012). The PLS has been extensively selected as a tool in the IS field (Chin et al., 2003). This study carried out a two-step analysis to test the measurement model and the structural model by using SmartPLS 3.3.9 (Ringle et al., 2014).

Common Method Bias

This research used the principal axis factoring method with Harman's one-factor test, ensuring that none of the factors individually explains the majority of the variance (Podsakoff, 2003). The results showed that the first factor explains 26.3% of the variance. No significant common method bias was found.

Measurement Model

To test a measurement model, this study analyzes the reliability, convergent validity, and discriminant validity of the measurements. To evaluate reliability, Cronbach's alpha and composite reliability (CR) were calculated. As described in **Table 2**, Cronbach's alpha and CR of all the constructs exceeded the recommended threshold of 0.7 (Nunnally, 1978).

Convergent validity was ensured by investigating both the average variance extracted (AVE) and the factor loadings of the items related to each construct. The AVE must be over 0.5, meaning that the latent variables account for more than half of the variance of their items (Henseler et al., 2009; Hair Jr et al., 2014). AVE values of all constructs, except cabin fever syndrome, were deemed to exhibit adequate, with a validity above the expected threshold. This study retains cabin fever syndrome since other estimates such as Cronbach's alpha and CR were well over the threshold (0.703 and 0.778, respectively). The factor loadings ranged from 0.581 to 0.966.

Finally, the discriminant validity was confirmed through the Fornell and Larcker (1981) and the heterotrait-monotrait ratio of correlations (HTMT) (Henseler et al., 2015). All the AVE values are higher than the correlation value for that column or row, ensuring the presence of discriminant validity (Fornell and Larcker, 1981). **Table 3** shows the correlation matrix and the results of the Fornell and Larcker evaluation.

The HTMT values for all factors were below the threshold of 0.95 (Ab Hamid et al., 2017) as depicted in **Table 4**.

This study assessed the predictive relevance Q^2 by using Blindfolding in SmartPLS. The omission distance *D* was set as 7. **Table 5** describes the results. All values of Q^2 were larger than the cut-off of 0. The cross-validated redundancy measures the capability of the path model to predict the endogenous measuring items indirectly from the prediction of their latent variables using the related structural relations. It is only computed for the endogenous variables.

Structural Model and Hypothesis Testing

An SEM was carried out to assess the proposed relationships among constructs through PLS. A bootstrap resampling technique (5,000 subsamples) was used to validate the significance of the hypotheses within the theoretical framework.

SEM did not show multicollinearity issues as the variance information factor (VIF) values were below 5. The VIF values for constructs were Social distancing attitude = 1.65, Social distancing intention = 1.66, Affective risk perception = 2.60, Cognitive risk perception = 2.34, and Cabin fever syndrome = 1.25.

Figure 2 shows the main path coefficients and explained endogenous variables' variances (R^2) for the structural model. Contrary to predictions, social distancing does not affect social network intensity, failing to support H1. Social distancing intention is not significantly related to social network intensity, failing to accept H2. Affective risk perception does not influence social network intensity, while it significantly affects social distancing attitude. Thus, H3a is not accepted and H3b is supported. Cognitive risk perception is not significantly related to social network intensity, whereas has a significant impact on social network intensity. Therefore, H4a is not supported and H4b is accepted. Cabin fever syndrome has a significant effect on social network intensity, affective risk perception, and cognitive risk perception, thereby supporting H5a, H5b, and H5c. Overall, the research model accounted for ~19% (0.191) of the variance in social network intensity, 14.7% (0.147) of the variance in social

¹ DanielSoper.com. Free Statistics Calculators Available at <https://www.danielsoper.com/statcalc/default.aspx> (accessed on 8 December 2021).

TABLE 2 | Scale reliabilities.

Construct	Items	Mean	St. Dev.	Factor loading	Cronbach's Alpha	CR	AVE
SNS usage intensity	SUI1	5.019	1.829	0.935	0.871	0.912	0.724
	SUI2	5.058	1.880	0.941			
	SUI3	4.519	1.834	0.794			
	SUI4	4.798	1.649	0.711			
Social distancing attitude	SDA1	5.490	1.352	0.818	0.778	0.869	0.689
	SDA2	5.077	1.504	0.846			
	SDA3	4.663	1.627	0.827			
Social distancing intention	SDI1	6.106	0.950	0.966	0.952	0.969	0.912
	SDI2	6.096	0.946	0.945			
	SDI3	6.192	0.921	0.953			
Affective risk perception	ARP1	4.663	1.864	0.918	0.910	0.936	0.786
	ARP2	5.423	1.591	0.869			
	ARP3	4.760	1.707	0.878			
	ARP4	5.212	1.479	0.880			
Cognitive risk perception	CRP1	4.452	1.709	0.865	0.784	0.858	0.604
	CRP2	3.231	1.564	0.738			
	CRP3	4.462	1.748	0.739			
	CRP4	3.721	1.638	0.759			
Cabin fever syndrome	CFS1	3.125	1.752	0.865	0.703	0.778	0.473
	CFS2	3.990	2.021	0.635			
	CFS3	3.885	2.006	0.633			
	CFS4	3.462	1.911	0.581			

TABLE 3 | Correlation matrix and discriminant assessment.

Constructs	1	2	3	4	5	6
1. SNS usage intensity	0.851					
2. Social distance attitude	0.221	0.830				
3. Social distance intention	0.080	0.581	0.955			
4. Affective risk perception	0.104	0.383	0.332	0.887		
5. Cognitive risk perception	0.110	0.271	0.203	0.739	0.777	
6. Cabin fever syndrome	0.243	0.059	−0.063	0.358	0.396	0.688

Diagonal values are the square root of AVE.

TABLE 4 | HTMT.

Constructs	1	2	3	4	5	6
1. SNS usage intensity						
2. Social distance attitude	0.264					
3. Social distance intention	0.125	0.685				
4. Affective risk perception	0.161	0.444	0.363			
5. Cognitive risk perception	0.152	0.350	0.214	0.865		
6. Cabin fever syndrome	0.315	0.229	0.169	0.294	0.386	

distancing attitude, and 4.1% (0.041) of the variance in social distancing intention.

The estimated coefficient of determination in this study is relatively low. This may be due to the following reasons.

First, the present work exploratorily verified the paths that have not been attempted in previous studies. R^2 may be low because the hypothesis was newly established and analyzed. Second, this research considered only University students as

the study subjects. The University student group may use SNS more frequently than other groups. This particularity may have undermined the generality of the model. **Table 6** summarizes the results of hypothesis testing.

Moreover, gender has no significant effects on SNS usage intensity. Age is significantly associated with SNS usage intensity. The plausible reason for this phenomenon is that older students have fewer compulsory classes than the younger group and thereby have more time to use SNS long. Besides, higher grades might use SNS more to share information and interact with acquaintances who are graduating or engaged in social activities.

F^2 depicts the contribution of each construct among the relationships within the research model (Bhutta et al., 2019). It also considers the significance of one construct on another construct along with the degree of its effectiveness. The score of the F^2 should be <0.02 to hold a significant relationship. **Table 7** describes the F^2 scores. In some effects, the criteria are not met. Nevertheless, the next verification was conducted since this study intended an exploratory analysis to develop a new research model.

This research tested the model fit indices of the structural model. Indices were standardized root mean square residual (SRMR), RMS_theta, Normative fit index (NFI), and Goodness-of-Fit (GoF). SRMR should be <0.08 and RMS_theta should be <0.1 (Hair et al., 2019). NFI must be over 0.95 (Hu and Bentler, 1999 cutoff). SRMR was 0.088 and RMS_theta was 0.180. NFI was 0.701. GoF is defined as “how well the specified model reproduces the observed covariance matrix among the indicator

items” (Hair et al., 1998). The model's GoF for this study was 0.305, indicating a medium level of fit (Wetzels et al., 2009). SRMR, RMS_theta, and NFI do not present a satisfactory level of criteria. Nonetheless, the results of hypothesis testing are discussed because the research model is not developed based on the existing theories.

DISCUSSION

The current study aimed to identify the effects of cabin fever syndrome and risk perception on SNS usage intensity through social distancing. This has been completed by developing the conceptual framework and validating it for University students.

The results showed that social distancing attitude and social distancing intention are not significantly related to SNS usage intensity. Social media offers a substitute for socialization in virtual spaces for face-to-face socialization (Kujath, 2011). Particularly, students actively socialized themselves on social media with their friends before the COVID-19 pandemic (Gao et al., 2020). The use of social media such as SNS may increase because face-to-face relationships are reduced under social distancing conditions. Chakraborty et al. (2020) revealed that CAVSD positively affects SNS usage intensity only in the age group of under 20 years. People under 20 years are subject to compulsory education. They would spend more time at home than older groups and might increase the use of social networking. On the other hand, those over the age of 20 years have other social life. Even if social distancing is enforced, they can operate in spaces other than home. They have more

TABLE 5 | Results of redundancy analysis.

Constructs	Cross-validated redundancy	
SNS usage intensity	0.117	Moderate predictive power
Social distancing attitude	0.096	Moderate predictive power
Social distancing intention	0.027	Moderate predictive power
Affective risk perception	0.089	Moderate predictive power
Cognitive risk perception	0.070	Moderate predictive power
Cabin fever syndrome		

TABLE 7 | Results of F^2 .

	1	2	3	4	5	6
1. SUI						
2. SDA	0.027					
3. SDI	0.000					
4. ARP	0.008	0.172				
5. CRP	0.001		0.043			
6. CFS	0.063			0.147	0.186	

TABLE 6 | Results of hypothesis testing.

H	Cause	Effect	Coefficient	t	Hypothesis
H1	Social distancing attitude	SNS usage intensity	0.189	0.239	Not Supported
H2	Social distancing intention	SNS usage intensity	−0.005	0.967	Not Supported
H3a	Affective risk perception	SNS usage intensity	−0.131	0.464	Not Supported
H3b	Affective risk perception	Social distancing attitude	0.383	0.000	Supported
H4a	Cognitive risk perception	SNS usage intensity	0.033	0.819	Not Supported
H4b	Cognitive risk perception	Social distancing intention	0.203	0.027	Supported
H5a	Cabin fever syndrome	SNS usage intensity	0.358	0.001	Supported
H5b	Cabin fever syndrome	Affective risk perception	0.396	0.000	Supported
H5c	Cabin fever syndrome	Cognitive risk perception	0.253	0.047	Supported

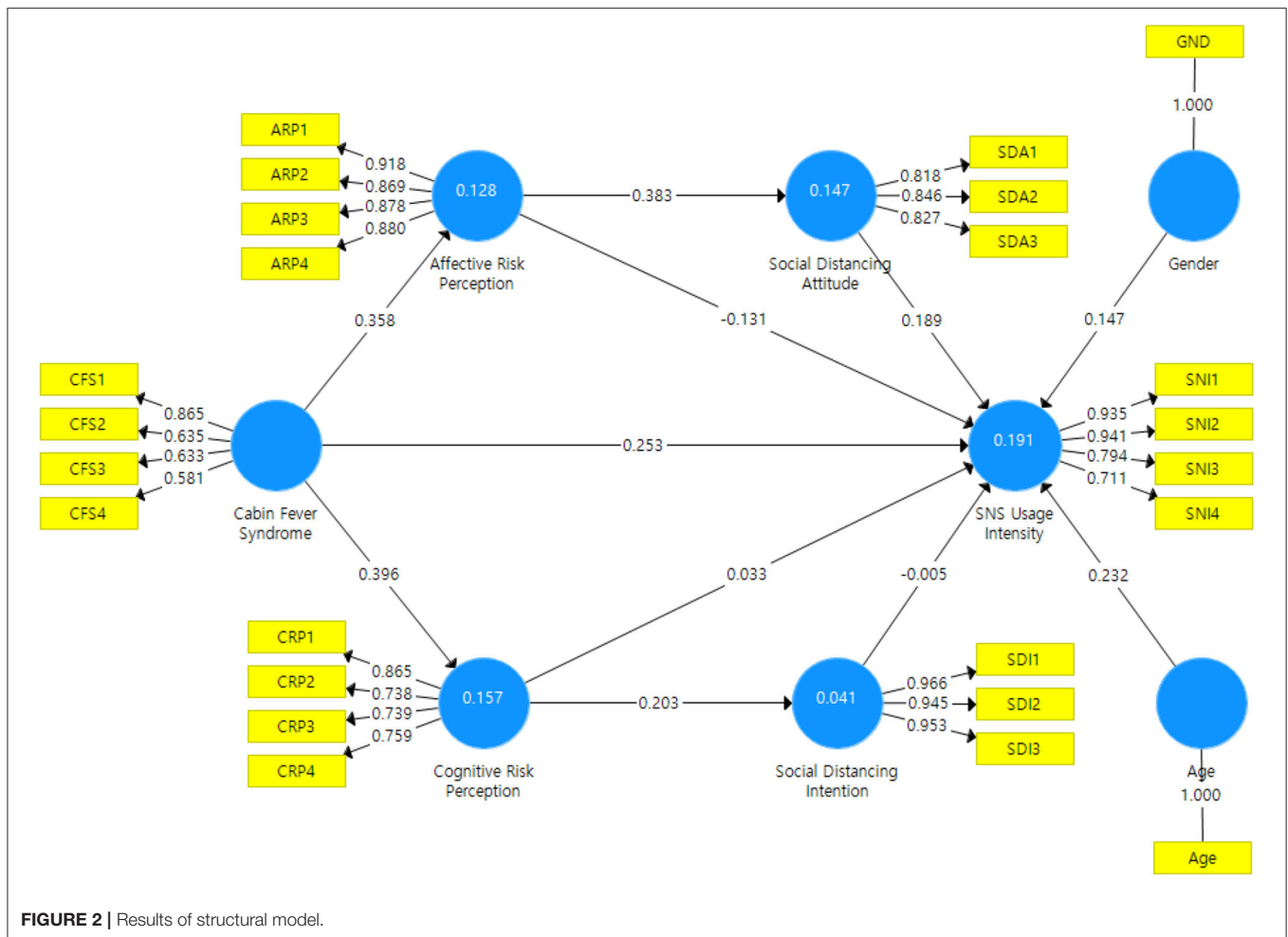


FIGURE 2 | Results of structural model.

alternatives to act or spend time than those who are under 20 years. Therefore, social network usage intensity would not change more than those under 20 years.

The findings of the research revealed that SNS usage intensity is not influenced by affective risk perception and cognitive risk perception. Previous studies support that people might have a relatively accurate risk perception during COVID-19 (Bodrud-Doza et al., 2020; Kuang et al., 2020). Chakraborty et al. (2020) proved that psychological impact significantly enhances the level of SNS usage intensity in people in their early 20s. University students who suffer from frustration or loneliness due to COVID-19 would solve their mental difficulties by increasing the use of SNS. However, students who perceive the risk as greater could be lowering their risk perception by performing health protection activities, not SNS.

The results of the present study pointed out that affective risk perception and cognitive risk perception have a positive impact on social distancing attitudes. It was also validated that risk perception is the salient determinant of social distancing attitude (Adiyoso and Wilopo, 2020). Similarly, the significant association between risk perception and preventive health behavior was also

supported in previous research (Dryhurst et al., 2020; Savadori and Lauriola, 2021). A possible explanation is the fact that the stronger students feel emotionally at risk for COVID-19, the higher the level of their attitude toward social distancing. Moreover, University students with a higher level of cognitive risk perception of COVID-19 may increase their intention toward social distancing. SNS activity does not directly reduce risk. Meanwhile, social distancing is a health protection behavior that decreases the probability of droplet infection. Students would engage in health-protective actions when affective risk perception and cognitive risk perception are raised. Previous research on the roles of affective risk perception and cognitive risk perception on health behavior has yielded mixed results (Bae and Chang, 2021; Savadori and Lauriola, 2021). The difference between the results of this work and former studies could be due to the type of health protection behaviors such as social distancing, contactless tours, and hygiene.

In addition, it was supported that cabin fever syndrome affected affective risk perception, cognitive risk perception, and SNS usage intensity. These results could be accredited to the following reasons. Students who feel uncomfortable

in an isolated space are more intensive in SNS activities. They may use cyberspace and channels to communicate with friends and acquaintances to relieve isolation or stress. The significant correlation between psychological impact and SNS usage intensity was also supported in the former research (Chakraborty et al., 2020). Cabin fever syndrome also raised the level of risk perception for COVID-19. This indicates that the more lethargic or socially separated people feel in a confined place, the stronger they perceive the risk of COVID-19. Support from family and friends can enhance social media use and strengthen psychological resilience (Asghar et al., 2021). Combining this study with Asghar et al. (2021), one can find that cabin fever syndrome increases SNS use and social media use promotes psychological resilience. Therefore, it may be meaningful to design an appropriate social media environment and provide it to users to stabilize their mental status.

CONCLUSION

Implications for Researchers and Practitioners

This study offers several implications for researchers and practitioners. First, the present study examines the roles of social distancing attitude and social distancing intention to explain SNS usage intensity during COVID-19. Existing studies have identified factors influencing social distancing practices (Adiyoso and Wilopo, 2020; Hagger et al., 2020), observations of negative emotion (Xiao et al., 2020), and the moderating effect on e-learning (Saxena et al., 2021). The results of the study reveal that both social distancing attitude and social distancing intention are not significantly related to SNS usage intensity in the 20s age group. This paper makes an academic contribution by revealing that the perception and behavior of social distancing among University students do not empirically affect the intensity of SNS use. Researchers can analyze groups such as office workers and freelancers to compare them with the results of this study. New results may be obtained by additionally illuminating groups that have changed working hours or conditions before and after the COVID-19 outbreak. SNS providers may be able to lower their priorities for factors related to social distancing when marketing to University students.

Second, this research newly contributed to academia by clarifying the impacts of affective risk perception and cognitive risk perception in shaping SNS usage intensity, social distancing attitude, and social distancing intention. It was found that risk perception affects social distancing. However, risk perception was shown to not affect the intensity of SNS use. In line with the results of this research, previous research has verified the significant effect of risk perception on social distancing (Adiyoso and Wilopo, 2020; Xie et al., 2020; Savadori and Lauriola, 2021). It will be meaningful for scholars to divide and analyze factors that influence health protection behavior and the frequency of SNS use, respectively. If future research identifies the role of

social norms and regulatory environments as a leading factor of social distancing along with risk perception, it may be possible to derive valuable implications for the public interest. At the same time, researchers can obtain beneficial results for the growth of the SNS market if they prove the effects of peer influence and social content as a deciding factor in SNS usage intensity. People may participate in social distancing if they become aware of the danger. Therefore, the disaster management headquarter should continue to inform citizens of the lethality of COVID-19 and the deadly nature of the disease. The disaster control tower needs to disclose the number of confirmed cases, infection routes, and new variants regarding the spread of COVID-19. By constantly updating the damage caused by COVID-19, it will be possible to form people's risk perception and realize social distancing.

Finally, this paper contributes to the literature by investigating the impact of cabin fever syndrome on SNS usage intensity, affective risk perception, and cognitive risk perception. The results show that cabin fever syndrome significantly determines SNS usage intensity, affective risk perception, and cognitive risk perception. It was found that the support of family and friends improves the level of psychological resilience via social media (Asghar et al., 2021). Therefore, it would be useful if policymakers provide an appropriate social media environment for people's mental recovery. They can examine the degree of claustrophobic restlessness of citizens and resolve their sense of helplessness. In addition, SNS providers need to launch new services or games that can alleviate these emotional troubles by conducting events such as small surveys that can identify users' levels of cabin fever syndrome.

Limitations and Future Research

Some limitations need to be claimed in this study. First, the analysis was performed only on the 20s group of SNS users. In future research, it is necessary to verify the reliability and validity of the research model by conducting a questionnaire for all age groups to provide a more comprehensive understanding. Second, the intensity of users might vary according to the purpose of use. There are many types of purposes such as pleasure, personal use, a commercial channel, and utilitarian needs. In particular, groups that use SNS commercially may have increased the frequency of use due to the increase in the non-face-to-face work environment after COVID-19. Therefore, it is needed to test the hypothesis according to the user's purpose of use. Finally, this study considered social distancing, risk perception, and cabin fever syndrome caused by COVID-19 to explain the intensity of SNS. In future studies, integrating the unique characteristics of SNS that have been changed due to COVID-19 would also enhance the explanatory power of the model.

AUTHOR'S NOTE

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DATA AVAILABILITY STATEMENT

The original contributions presented in the study are included in the article/supplementary material, further inquiries can be directed to the corresponding authors.

AUTHOR CONTRIBUTIONS

The author confirms being the sole contributor of this work and has approved it for publication.

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APPENDIX

TABLE A | Survey instrument.

Construct	Item	Mean
SNS Usage Intensity Eid and Al-Jabri, 2016	SUI1	During social distancing/lockdown, I am using social networking (SN) more than normal.
	SUI2	During social distancing/lockdown, I am logging into my SN sites more frequently.
	SUI3	During social distancing/lockdown, I am sending/forwarding messages to my friends more than normal.
	SUI4	During social distancing/lockdown, I am using social networking sites for reading news and attending social gathering.
Social Distancing Attitude Williams et al., 2015	SDA1	In my opinion, the use of social distancing will have a positive impact to control COVID-19.
	SDA2	The use of social distancing is beneficial for the care of the patients.
	SDA3	I find it interesting to use social distancing for the control of COVID-19.
Social Distancing Intention Williams et al., 2015	SDI1	I have the intention to use social distancing when it becomes useful to avoid COVID-19
	SDI2	I have the intention to use social distancing when necessary to provide good results to avoid COVID -19
	SDI3	I have the intention to use social distancing for the care of myself and others
Affective Risk perception Brug et al., 2004; Bae and Chang, 2021	ARP1	I am worried that I will contract COVID-19.
	ARP2	I am worried about my family members contracting COVID-19.
	ARP3	I am worried about COVID-19 occurring in my region.
	ARP4	I am worried about COVID-19 emerging as a health issue.
Cognitive Risk Perception Brug et al., 2004; Bae and Chang, 2021	CRP1	There is a high likelihood of acquiring COVID-19 in general.
	CRP2	There is a high likelihood that I will acquire COVID-19 compared to other people.
	CRP3	There is a high likelihood of acquiring COVID-19 compared to other diseases.
	CRP4	There is a high likelihood of dying from COVID-19.
Cabin Fever Syndrome Fritscher, 2020b; Robinson, 2020	CFS1	I feel restless staying at home.
	CFS2	I have trouble concentrating while staying at home during social distancing/lockdown.
	CFS3	I have food cravings while staying at home during social distancing/lockdown.
	CFS4	I have a feeling of social isolation while staying at home during social distancing/lockdown.



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Longitudinal survey of depressive symptoms among university students during the COVID-19 pandemic in Japan

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While changes in response to the different stages of the pandemic remain unknown, this study investigated the longitudinal impact of the COVID-19 pandemic on depressive symptoms in Japanese university students and identified factors associated with new onset of depression and suicidal ideation. Two surveys were conducted at one university in Akita, Japan, during the first COVID-19 outbreak period (T1: May–June 2020) and 1 year later (T2: March–May 2021). Moderate depressive symptoms were defined as a Patient Health Questionnaire-9 score ≥ 10 and suicide-related ideation score ≥ 1 on question 9 of the questionnaire. Among 985 students who completed surveys in T1 and T2, participants with moderate depressive symptoms and suicide-related ideation increased from 11 to 17% and from 5.8 to 11.8%, respectively. Among 872 students at risk after excluding those with moderate depressive symptoms at T1, 103 students (11.8%) developed moderate depressive symptoms at T2. Among the 928 students at risk, after excluding those who had suicidal ideation at T1, 79 (8.5%) developed suicidal ideation. Multivariate logistic modeling revealed financial insecurity and academic performance as risk factors ($p < 0.01$), while having someone to consult about worries was a coping factor for depressive symptoms and suicidal ideation ($p < 0.001$). Our findings demonstrated that socioenvironmental factors may determine depressive symptoms of university students.

KEYWORDS

COVID-19 pandemic, depressive symptoms, PHQ-9, longitudinal study, suicide ideation, university students, Japan

Introduction

The outbreak of the coronavirus disease 2019 (COVID-19) was first reported in Japan on January 15, 2020, subsequently becoming a global pandemic. A nationwide state of alert was first declared in April, 2020, and the number of cases reached 239 million (4.87 million deaths) as of October 14, 2021 (Corona Virus Research Center, 2020). While COVID-19 is considered a major global progressive disaster, previous studies have shown

that young adolescents are among the most vulnerable populations, because they have fewer resources to cope with the disaster (Rodríguez-Hidalgo et al., 2020). The COVID-19 pandemic, which calls for strict preventive public health measures such as prolonged home quarantine and social distancing, has negatively and significantly affected students' mental health (Marroquín et al., 2020; Li et al., 2021). Two large longitudinal studies among 68,685 (Li et al., 2021) and 14,769 (Wu et al., 2021) students reported that depression and anxiety in college students have persisted for more than 6 months since the onset of the outbreak (Li et al., 2021; Wu et al., 2021). Previous studies reported that predictors of during-pandemic anxiety and depression included freshman status (Mehus et al., 2021), loneliness (Lee et al., 2020), and financial insecurity (Jones et al., 2021). Such unprecedentedly prolonged psychological burdens may have an adverse impact on student mental health. For instance, a psychiatric survey reported that the mean age of major depressive disorder onset is 26 years with its peak between 13 and 18 years, and an earlier onset was associated with social isolation, poorer quality of life, a more negative view of life, more lifetime depressive episodes and suicide attempts, compared to those with a later onset (Zisook et al., 2007).

Prior to the current study, we conducted a mental-health survey among students of one university during the first outbreak and found that 11% of students had moderate depressive symptoms (Nomura et al., 2021). Compared to a national survey in the US which reported that the prevalence of depression among college students was approximately 7% (Blanco et al., 2008), our reported prevalence was much higher. Additionally, we found that being a woman and the negative lifestyle choices of smoking and drinking may be important risk factors for depressive symptoms, while exercise and having someone to consult about worries may be protective factors. However, due to the study's cross-sectional design, we were unable to determine how mental health changes in response to different stages of the pandemic, and if previous risk and coping factors can be applied to mental health deterioration. Thus, the purpose of this new study was twofold: (1) to investigate the longitudinal effect of the COVID-19 pandemic on depressive symptoms and suicidal ideation among students in a university setting over the year since the first outbreak, and (2) to identify factors associated with the onset of depressive symptoms and suicidal ideation. Results from this study may inform potential interventions to combat the effects of the COVID-19 pandemic on student mental health.

Materials and methods

Study design

All data were obtained from two sequential Student Mental Health Surveys, a two-wave cross-sectional study tool identifying individuals at high risk of depression and suicidal ideation. The first

survey was conducted between May 20 and June 16, 2020 (T1), during the first emergency state of alert in Japan (the first outbreak); the second survey was conducted about 1 year later between March 1 and May 31, 2021 (T2). Students were under self-home quarantine during the first survey, which left freshmen especially isolated, because they were not allowed to visit campus for 6 months after their enrollment. In contrast, during the second survey, infection control had been relaxed, so people were more relieved.

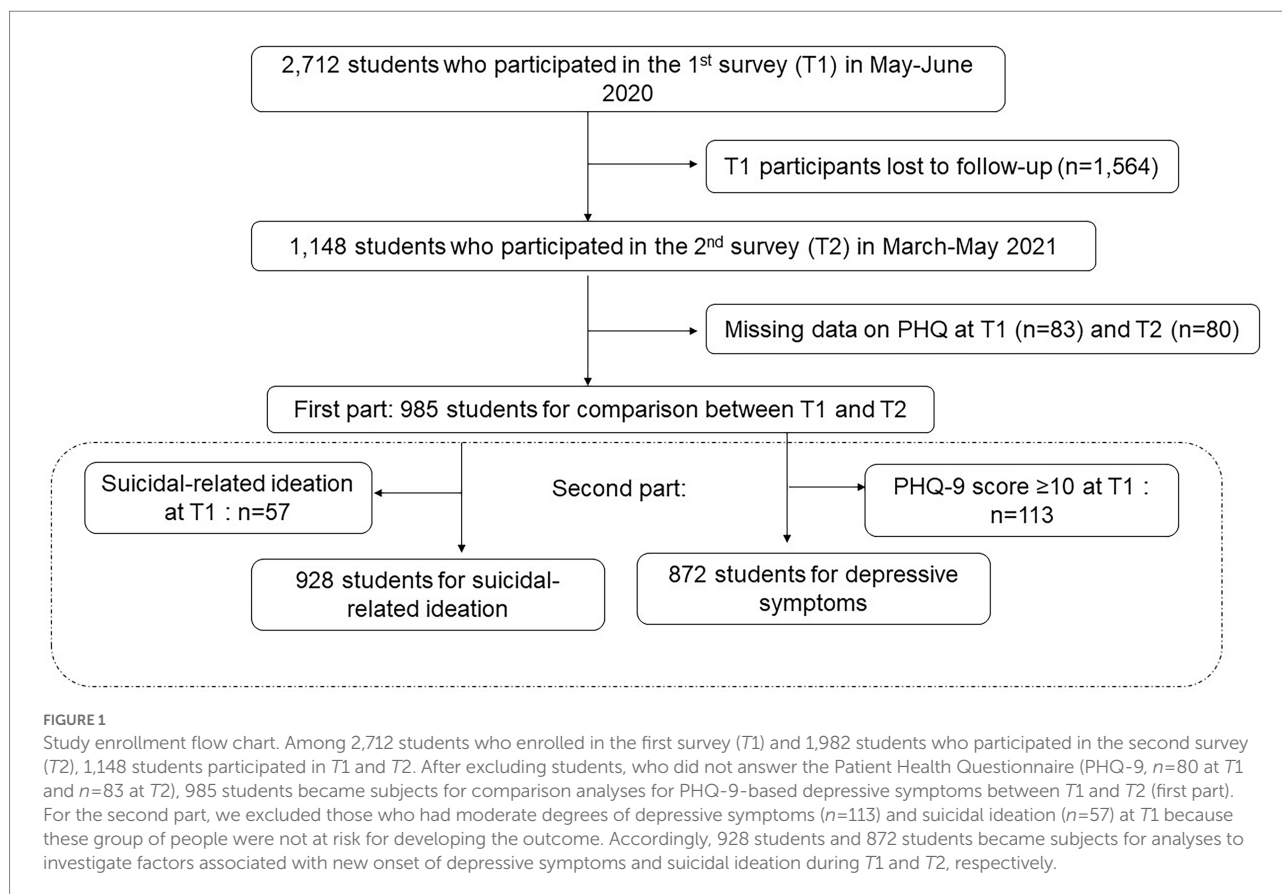
Participants

As details of the study are described elsewhere (Nomura et al., 2021), only a brief description is provided here. All students were recruited *via* institutional email and asked to log in to the e-classroom platform to find a link to the online self-administered questionnaire. The survey was voluntary; students could submit an opt-out withdrawal form, available on the research administration office website, at any time. This study was approved by the Institutional Review Board of Akita University Medical School (no. 2520).

As of the first survey date, May 16, 2020, there were 5,111 graduate and undergraduate students enrolled at Akita University. Of these, 2,712 students enrolled in the first survey (response rate 53%); 1,982 students participated in the second survey (response rate: 39%). First, we extracted data from 1,148 students, who participated in both the first and second surveys. After excluding students, who did not answer the Patient Health Questionnaire (PHQ-9, $n=83$ at T1 and $n=80$ at T2), the responses of 985 students (mean age, 20 years, female 51%, freshmen 36%) were analyzed to compare PHQ-9-based depressive symptoms between T1 and T2 (first part, Figure 1). Next, we excluded those who had moderate degrees of depressive symptoms ($n=113$) and suicidal ideation ($n=57$) at T1, because these groups of people were not at risk for developing the outcome in a cohort study. Accordingly, we investigated the factors associated with the new onset of these symptoms during T1 and T2 (second part, Figure 1).

Questionnaire

The study's web-based surveys were composed of 51 (first survey) and 36 (second survey) multiple-choice questions. The surveys included questions about students' living arrangements (alone or with family/others); place of origin (within local area, Akita, or outside Akita); availability of someone to consult with about worries (yes, no, and do not know); height and weight; smoking status (never, former, and current); alcohol consumption (6–7 days/week, 3–4 days/week, 1–2 days/week, and never); daily exercise (minutes per day); frequency of communication within their social networks (6–7 days/week, 3–4 days/week, 1–2 days/week, and never); communication tools including text (e.g., LINE, Twitter, and Facebook), voice (e.g., telephone, iPhone, mobile phone, and LINE), and video (e.g., Skype, LINE, and Zoom); people with whom they communicated (family, friends, partners,



acquaintances, and strangers); and worries about financial security, academic performance, limitation of leisure activity, social support, and physical activity. Participants were asked to indicate which of the abovementioned five domains of worry they were most concerned about. Daily exercise was measured according to intensity—light [up to four metabolic equivalents (METs)], moderate (5–6 METs), vigorous (7–8 METs), and very vigorous (9–10 METs); and multiplied by an exercise period (Figure 2).

Depressive symptom and suicide-related ideation based on PHQ-9

Depressive symptoms were identified using the validated Japanese version of the PHQ-9 (Kroenke et al., 2001), based on the nine criteria for depression proposed by the Diagnostic and Statistical Manual of Mental Disorders, 5th edition. Each PHQ-9 item was rated on a 4-point Likert scale ranging from 0 (not at all) to 3 (almost every day). PHQ-9 scores were divided into five groups representing varying levels of severity of depressive symptoms: 0–4 (minimal or none), 5–9 (mild), 10–14 (moderate), 15–19 (moderately severe), and 20–27 (severe). Total scores ranged from 0 to 27; the higher the score, the more intense the depressive symptoms. Reliability, as determined by Cronbach's alpha, was 0.86 (T1) and 0.89 (T2). The established PHQ-9 cutoff score of 10 (PHQ-9 ≥ 10), which has previously demonstrated

high sensitivity and specificity in detecting major depression, was used (Manea et al., 2012).

Question 9 of the PHQ-9, encompassing thoughts of both suicide and self-harm (Silverman et al., 2007), assessed suicide-related ideation, based on existent literature (Mitsui et al., 2018). Participants were asked, “During past two weeks, have you thought that you would be better off dead or by hurting yourself in some way?” Responses were 0 (none), 1 (at least 2 days per week), 2 (1 entire week during past 2 weeks), and 3 (nearly every day). Question 9 scores ≥ 1 were considered indicative of suicide-related ideation and a score ≥ 2 was treated as “severe suicide-related ideation.”

Statistical analysis

First, to assess bias due to potential differential attrition between included and excluded participants for analyses, we tested statistical differences by using a Chi-square test or *t*-test. Next, for respondents who participated in both surveys, we tested statistical differences using McNemar's test for a binary variable, the McNemar-Bowker test for three or more categorical variables, and the Wilcoxon signed-rank test for a continuous variable. Third, after excluding a moderate degree of depressive symptoms based on a PHQ-9 score ≥ 10 at T1, we conducted a bivariable χ^2 analysis to assess the association between demographic characteristics and new onset of moderate degree of depressive symptoms based on a

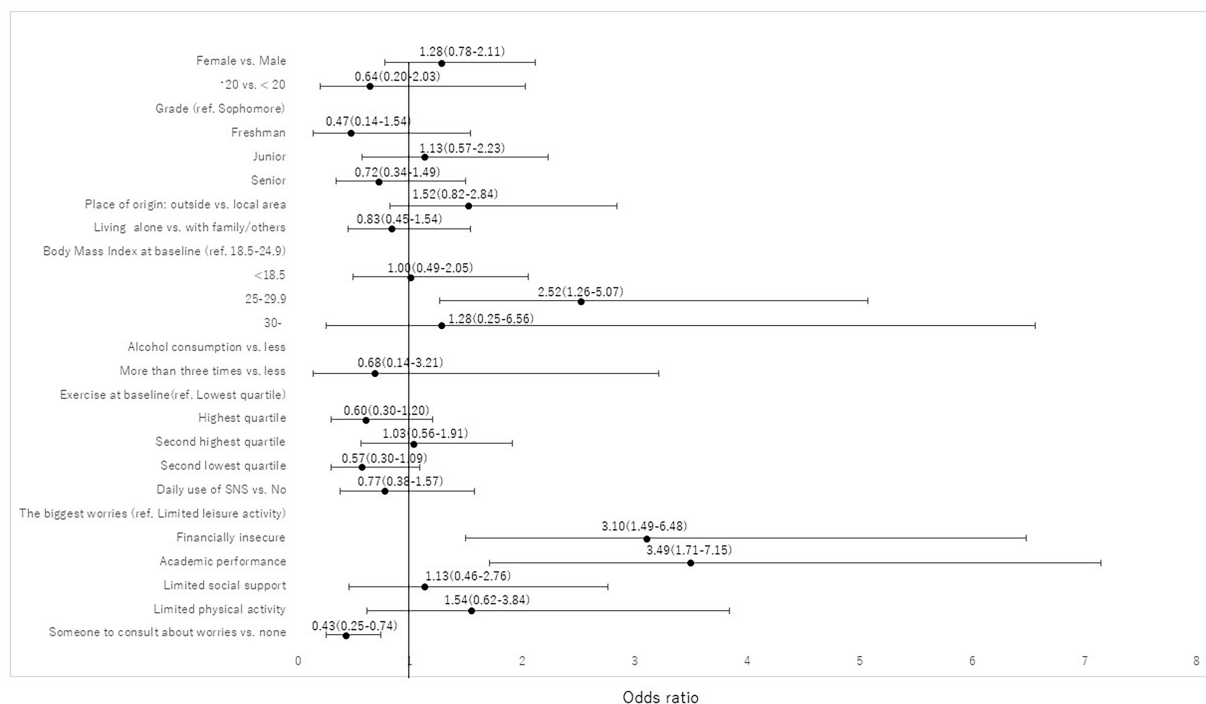


FIGURE 2

Factors associated with new onset of moderate depression based on PHQ-9 score ≥ 10 at T2. The multivariate model demonstrated that being overweight (OR, 2.52, 95% CI, 1.26–5.07), financial insecurity (OR, 3.10, 95% CI, 1.49–6.48) and academic performance (OR, 3.49, 95% CI, 1.71–7.15) were the biggest worries and risk factors, while the presence of someone to consult with about worries (OR 0.43, 95% CI, 0.25–0.74) was a coping factor.

PHQ-9 score ≥ 10 at T2. Logistic regression was then used to estimate odds ratios (ORs) and 95% confidence intervals (CIs) for risk and coping factors associated with new onset of moderate degree of depressive symptoms at T2. We included all covariates investigated in the univariable models into multivariable logistic regression models because we considered these important factors associated with depressive symptoms based on our previous study (Nomura et al., 2021). Fourth, we performed the same analyses for suicidal-related ideation. We excluded suicidal ideation at T1 and then tested the association between variables and a new onset of suicidal ideation at T2 (Figure 3).

All analyses were performed using STATA14-MP (StataCorp LLC, College Station, TX, United States). Statistical significance was set at a two-sided value of p of < 0.05 .

Results

Demographics of T1 and T2 participants and T1 participants lost to follow-up

Those lost to follow-up ($n = 1,564$) were mostly male and had higher scores of worries for financial insecurities, academic performance, limited leisure activity, and physical activity (all $ps < 0.05$). The prevalence of depression and suicide-related ideation, and the proportion of those who had someone to

consult with about worries were not statistically different between the two groups (Table 1).

Depressive symptoms and suicide-related ideation at T1 and T2

Prevalence of PHQ-9 categories between T1 and T2 are shown in Supplementary Table S1. The prevalence of those with a score ≥ 10 on the PHQ-9, indicative of moderate depressive symptoms, increased from 11.5 to 16.6% with a +44% change ($ps < 0.0001$ in all students). Prevalence of suicide-related ideation between T1 and T2 increased from 5.8 to 11.8% with +103% change, and severe suicide-related ideation also increased from 1.7 to 5.0% with +194% change ($ps < 0.0001$ in all students).

Health-related variables at T1 and T2

The majority of students (54%) increased weekly exercise volume, based on the difference (i.e., volume in T2–volume in T1 > 0). The number of frequent drinkers (i.e., more than three times a week) and current smokers increased from 3.4 to 7.4% ($p < 0.001$), and from 2.1 to 3.0% ($p = 0.057$), respectively (Table 2).

Of those who used social networking services (SNS) every day, 87% used text, 15% used voice communication, and 4.6%

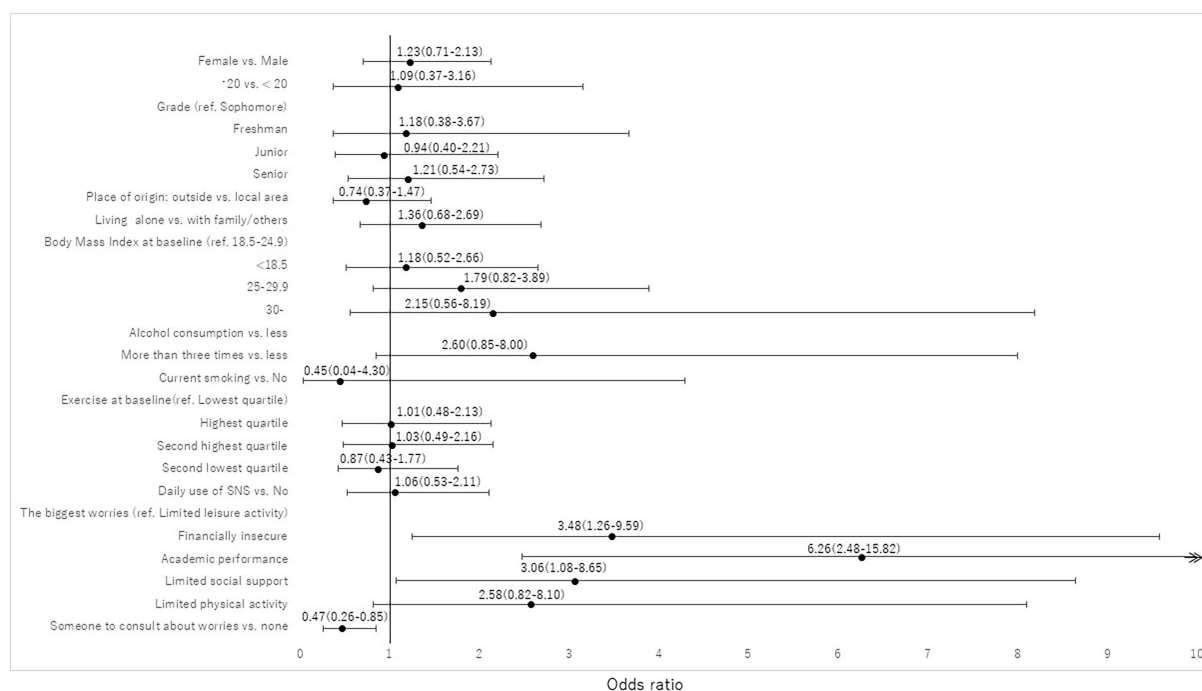


FIGURE 3

Risk and coping factors associated with new onset of suicide related ideation at T2. The multivariate logistic model demonstrated that financial insecurity (OR, 3.48, 95% CI, 1.26–9.59), academic performance (OR 6.26, 95% CI, 2.48–15.82), and limited social support (OR 3.06, 95% CI, 1.08–8.65) were significantly associated with a new onset of suicidal-related ideation, while having someone to consult with about worries (OR 0.47, 95% CI, 0.26–0.85) was a coping factor.

used video communication (data not shown). The number of students who used SNS by either voice or video every day, did not differ between T1 and T2 ($p=0.749$). Among these students, approximately one-tenth communicated with strangers (10.4% in T1 and 11.8% in T2) and they were not statistically associated with depressive symptoms.

The number of students who chose limited leisure activity greatly increased, and the remaining four worry-related domains declined over the two points in time ($p<0.001$). The median of each worry except for limited leisure activity and social support in daily lives, decreased from T1 to T2 (all $ps<0.05$) while the median of limited leisure activity increased over the two points in time ($p<0.001$). The proportion of having someone to consult with significantly increased from 80.1 to 83.8% ($p=0.007$, Table 2).

Although data are not shown, freshmen increased exercise volume, drinking frequency, and their limited leisure activity scores at T2 ($p<0.01$, $p=0.02$, and $p<0.01$, respectively). In spite of non-significance, the proportion of having someone to consult with also increased from 78.5 to 82.5% ($p=0.12$).

New onset of moderate depression at T2

Factors associated with a new onset of moderate depression at T2 are outlined in Table 3. Among 872 students at risk, 103

students (11.8%) newly developed a moderate degree of depressive symptoms between T1 and T2; the gender breakdown was 57 (13.0%) females and 46 (10.7%) males. Students who were overweight had the highest incidence of depressive symptoms (19.2%) compared to those with normal weight (11.1%). Among the five worries, students who perceived financial insecurity had the highest incidence of depressive symptoms (17.2%) followed by those who had a worry with academic performance (16.2%). Students who had someone to consult about worries were less likely to develop depressive symptoms compared to those who did not (10.0% vs. 21.0%). Grade, smoking and drinking habits, and exercise were not statistically associated with a new onset of moderate degree of depression. The univariate logistic regression model demonstrated that being overweight compared to normal weight ($p=0.038$), and perception of financial insecurity ($p=0.001$) and academic performance ($p=0.001$) as compared to limited leisure activity, and the presence of someone to consult about worries ($p<0.001$), were significantly associated with a new onset of moderate degree of depressive symptoms. The multivariate model demonstrated that being overweight (OR, 2.52, 95% CI, 1.26–5.07), financial insecurity (OR, 3.10, 95% CI, 1.49–6.48) and academic performance (OR, 3.49, 95% CI, 1.71–7.15) were the biggest worries and risk factors, while the presence of someone to consult with about worries (OR 0.43, 95% CI, 0.25–0.74) was a coping factor.

TABLE 1 Demographics of T1 (during first wave of the pandemic in May–June 2020) and T2 (March–May in 2021) participants ($n=1,148$) and participants lost to follow-up ($n=1,564$).

Characteristics	T1 and T2 participants	T1 participants lost to follow-up	Mean difference (95%CI), p
	$n = 1,148$	$n = 1,564$	
Sex			< 0.001
Male	585 (51.0)	824 (52.7)	
Female	563 (49.0)	617 (39.5)	
Unknown	0	123 (7.9)	
Age, mean \pm sd	20.4 \pm 4.0	20.6 \pm 2.9	(−0.47, 0.09)
Having someone to consult (n , %)	872 (76.0)	1,055 (67.5)	$p = 0.091$
Worries (median, IQR)			
Financially insecure	3 (1–6)	4 (1–7)	$p < 0.001$
Academic performance	3 (1–6)	4 (2–6)	$p < 0.001$
Limited leisure activity	5 (3–8)	6 (3–8)	$p < 0.001$
Limited social support	4 (1–7)	4 (1–7)	$p = 0.697$
Limited physical activity	4 (2–6)	4 (2–7)	$p = 0.036$
Depressive Symptoms			
PHQ9 ≥ 10			
T1	11.5% (9.7–13.6%)	11.6% (9.9–13.4%)	0.973
Suicide-related ideation			
T1	5.8% (4.5–7.4%)	7.3% (6.0–8.8%)	0.157

Summation which does not reach total number indicates missing in each category.

New onset of suicidal-related ideation at T2

Risk and coping factors associated with a new onset of suicidal-related ideation at T2 are outlined in Table 4. Among 928 students at risk, 79 (8.5%) newly developed suicidal ideations. Among the five worries, students who perceived financial insecurity (9.1%), academic performance (15.1%), and limited social support (8.9%) tended to have higher incidence of suicidal related ideation compared with those who had worry about limited leisure activity (3.1%). Students who had someone to consult about worries were less likely to develop suicidal-related ideation compared to those who did not (7.0% vs. 15.4%). The multivariate logistic model demonstrated that financial insecurity (OR, 3.48, 95% CI, 1.26–9.59), academic performance (OR 6.26, 95% CI, 2.48–15.82), and limited social support (OR 3.06, 95% CI, 1.08–8.65) were significantly associated with a new onset of suicidal-related ideation, while having someone to consult with about worries (OR 0.47, 95% CI, 0.26–0.85) was a coping factor.

Discussion

Among the very few studies that have assessed the mental health of university students over 6 months or more since the COVID-19 pandemic, our study demonstrated that the one-year longitudinal effect of the pandemic had a clear and negative impact on depressive symptoms and suicide-related ideation among university students. Among 985 students who completed surveys in T1 and T2, participants with moderate depressive

symptoms and suicide-related ideation increased from 11.5 to 16.6%, and from 5.8 to 11.8%, respectively.

The prevalence of a moderate degree of depressive symptoms in T1 was much lower compared with reports among students overseas: Germany (37%; Kohls et al., 2021), Greece (48.5%; Giannopoulou et al., 2021), and Ukraine (19.2%; Rogowska et al., 2020). This low prevalence of depressive symptoms and suicidal ideation may be explained by the extent of the pandemic's effect. Japan has had fewer cases and deaths, and lockdown measures have not yet been expanded, due to the Japanese Constitution's emphasis on the protection of citizens' rights. However, our finding of a greater increase in suicidal ideation than the prevalence of depressive symptoms, indicates the seriousness of the psychological consequences of COVID-19 in university students.

A meta-analysis of 22 studies (Thomas et al., 2012) suggests that peritraumatic distress is expected to diminish as time progresses after the introduction of a traumatic event. Although students' psychological distress may not be diagnosed as PTSD, the upward trend of depressive symptom prevalence over 1 year, seen in this study, contradicts this expectation and suggests that there may be factors other than peritraumatic distress that increasingly account for the long-term trajectory of psychological illness. Literature reviews of the COVID-19 pandemic and related mental health consequences suggest that a variety of factors are associated with a higher risk of psychiatric symptoms and/or low psychological well-being, including female gender (Wathelet et al., 2020), low income (Sugaya et al., 2021), social isolation (Sugaya et al., 2021), and poor self-related health (Vindegard and Benros, 2020). During the COVID-19 pandemic, students have been placed in stressful situations that include frustrations about social

TABLE 2 Health-related variables at T1 (during first wave of pandemic in May–June 2020) and T2 (in March–May 2021): $n=985$.

	T1		T2		<i>p</i>
	<i>n</i> (%)	Missing <i>n</i> (%)	<i>n</i> (%)	Missing <i>n</i> (%)	
Body mass index		33 (3)		269 (27)	0.127
< 18.5	130 (13.7)		112 (15.6)		
18.5–24.9	719 (75.5)		537 (75.0)		
25–29.9	84 (8.8)		57 (8.0)		
30–	19 (2.0)		10 (1.4)		
Exercise (METs ^a min/week), median (interquartile range)		78 (8)		140 (14)	< 0.001
	480 (160–1,200)		720 (240–1,680)		
Drinking frequency		2 (0)		7 (1)	< 0.001
More than three times a week	33 (3.4)		72 (7.4)		
Less than twice a week	950 (96.5)		906 (92.6)		
Current smoking	21 (2.1)	2 (0)	29 (3.0)	5 (1)	0.057
Daily use of SNS	1 (0)		2 (0)		
By either voice or face	163 (16.6)		170 (17.3)		0.749
With whom to communicate					
Family	119 (73.0)		129 (75.9)		0.815
Friend	128 (78.5)		141 (82.9)		0.670
Acquaintance	55 (33.7)		71 (41.8)		0.847
Partners	59 (36.2)		56 (32.9)		0.782
Strangers	17 (10.4)		20 (11.8)		0.791
One of the biggest worries		3 (0)		4 (0)	< 0.001
Financially insecure	187 (19.0)		142 (14.4)		
Academic performance	237 (24.1)		168 (17.1)		
Limited leisure activity	272 (27.6)		441 (44.8)		
Limited social support	169 (17.2)		138 (14.0)		
Limited physical activity	117 (11.9)		92 (9.3)		
Worries in daily lives, median (interquartile range)					
Financial constraint	3 (1–6)	4 (0)	3 (1–5)	1 (0)	< 0.001
Academic performance	3 (1–6)	2 (0)	3 (1–5)	4 (0)	0.026
Limited leisure activity	5 (3–8)	0 (0)	7 (4–9)	7 (1)	< 0.001
Limited social support	4 (1–7)	2 (0)	4 (1–7)	4 (0)	0.570
Limited physical activity	4 (2–6)	5 (1)	3 (1–6)	10 (1)	< 0.001
Having someone to consult	787 (79.9)	3 (0)	824 (83.7)	2 (0)	0.007

^aBased on McNemar, McNemar-Bowker, Wilcoxon signed-rank test.

Summation which does not reach total number indicates missing in each category.

distancing, strict local rules, and postponement and sudden cancelation of academic activities. Referring to a labor force survey, the number of working students has declined sharply since March, 2020, falling by 780,000 (46%) in April (Ministry of Internal Affairs and Communications, 2020). Accordingly, nearly half of the working students have lost their jobs, which has impacted their lives, studies, and health (Tsurugano et al., 2021). Our findings correspond with Tsurugano et al.'s (2021) report that students who experienced financial insecurity were more likely to report depressive symptoms. Similar studies that investigated the general population also confirm that financial constraints are associated with depression (Ettman et al., 2020; Fuse-Nagase et al., 2020; Pieh et al., 2020). These findings strongly suggest that financial insecurity is an independent predictor of depression. While some cross-sectional studies reported negative impacts of psychological difficulties on students' academic performance

(Awadalla et al., 2020), a longitudinal study of 1,140 university students with a 15-month follow-up demonstrated that dissatisfaction with current education increased risk for depression and anxiety (Hossain et al., 2019). Our study also found that worries about academic performance were associated with increased risk of a moderate degree of depressive symptoms and suicidal ideation. Frustration may be so overwhelming that students develop additional psychiatric problems.

There is increasing evidence that social isolation is associated with increased symptom severity of depression and anxiety (Mehus et al., 2021; Sugaya et al., 2021). During the COVID-19 pandemic, freshmen were considered a vulnerable population, because this group of students may encounter simultaneous multiple difficulties, including financial distress related to tuition and living expenses, and limited social support (Mehus et al., 2021). We performed an additional analysis and found that

TABLE 3 Factors associated with new onset of moderate depression based on PHQ-9 score ≥ 10 at T2 (in March–May 2021): $n=872$.

		New onset of PHQ-9 score ≥ 10	Logistic regression model	
		$n = 103, 11.8\%$	Univariate	Multivariate
		$N (\%)$	OR (95%CI)	Adjusted OR (95%CI) ^a
Sex	Female ($n = 440$)	57 (13.0)	0.80 (0.53–1.21)	1.28 (0.78–2.11)
	Male ($n = 431$)	46 (10.7)		
Age	≥ 20 ($n = 614$)	77 (12.5)	1.27 (0.80–2.04)	0.64 (0.20–2.03)
	< 20 ($n = 257$)	26 (10.1)		
Grade	Freshman ($n = 315$)	31 (9.8)	0.76 (0.44–1.34)	0.47 (0.14–1.54)
	Sophomore ($n = 200$)	25 (12.5)	Ref	Ref
	Junior ($n = 183$)	29 (15.8)	1.32 (0.74–2.35)	1.13 (0.57–2.23)
	Senior ($n = 174$)	18 (10.3)	0.81 (0.42–1.54)	0.72 (0.34–1.49)
Place of origin	Local area ($n = 401$)	43 (10.7)	Ref	Ref
	Outside ($n = 469$)	59 (12.6)	1.20 (0.79–1.82)	1.52 (0.82–2.84)
Living arrangement	Alone ($n = 496$)	58 (11.7)	0.94 (0.62–1.43)	0.83 (0.45–1.54)
	With family/others ($n = 366$)	45 (12.3)	Ref	Ref
Body mass index at baseline	< 18.5 ($n = 115$)	13 (11.3)	1.02 (0.55–1.92)	1.00 (0.49–2.05)
	18.5–24.9 ($n = 642$)	71 (11.1)	Ref	Ref
	25–29.9 ($n = 78$)	15 (19.2)	1.91 (1.04–3.54)	2.52 (1.26–5.07)
	30– ($n = 14$)	2 (14.3)	1.34 (0.29–6.11)	1.28 (0.25–6.56)
Alcohol consumption	More than three times ($n = 26$)	2 (7.7)	0.62 (0.14–2.66)	0.68 (0.14–3.21)
	Less ($n = 844$)	100 (11.9)	Ref	Ref
Current smoking	Yes ($n = 15$)	0 (0)	NA	NA
	No ($n = 855$)	103 (12.1)		
Exercise at baseline (METs*min/week)	Highest quartile ($n = 199$)	16 (8.0)	0.55 (0.29–1.04)	0.60 (0.30–1.20)
	Second highest quartile ($n = 187$)	25 (13.4)	0.97 (0.54–1.72)	1.03 (0.56–1.91)
	Second lowest quartile ($n = 204$)	22 (10.8)	0.76 (0.42–1.37)	0.57 (0.30–1.09)
	Lowest quartile ($n = 211$)	29 (13.7)	Ref	Ref
Daily use of SNS by voice or face	Yes ($n = 134$)	13 (9.7)	0.78 (0.42–1.44)	0.77 (0.38–1.57)
	No ($n = 728$)	88 (12.1)	Ref	Ref
One of the biggest worries	Financially insecure ($n = 169$)	29 (17.2)	3.06 (1.60–5.82)	3.10 (1.49–6.48)
	Academic performance ($n = 197$)	32 (16.2)	2.86 (1.52–5.38)	3.49 (1.71–7.15)
	Limited leisure activity ($n = 252$)	16 (6.4)	Ref	Ref
	Limited social support ($n = 145$)	14 (9.7)	1.58 (0.75–3.33)	1.13 (0.46–2.76)
	Limited physical activity ($n = 107$)	11 (10.3)	1.69 (0.76–3.77)	1.54 (0.62–3.84)
Presence of someone to consult about worries	Yes ($n = 721$)	72 (10.0)	0.42 (0.26–0.67)	0.43 (0.25–0.74)
	No ($n = 148$)	31 (21.0)	Ref	Ref

^a p Value for 3 or more category < 0.01 .

Summation which does not reach total number indicates missing in each category.

TABLE 4 Risk and coping factors associated with new onset of suicide related ideation at T2 (in March–May 2021): $n=928$.

		New onset of suicide related ideation <i>n</i> = 79, 8.5%	Logistic regression model	
			Univariate	Multivariate
			OR (95%CI)	Adjusted OR (95%CI)
		<i>N</i> (%)		
Sex	Female (<i>n</i> = 472)	44 (9.3)	0.81 (0.51–1.29)	1.23 (0.71–2.13)
	Male (<i>n</i> = 455)	35 (7.7)		
Age	≥ 20 (<i>n</i> = 657)	59 (9.0)	1.23 (0.73–2.09)	1.09 (0.37–3.16)
	< 20 (<i>n</i> = 270)	20 (7.4)		
Grade	Freshman (<i>n</i> = 338)	26 (7.7)	1.08 (0.56–2.10)	1.18 (0.38–3.67)
	Sophomore (<i>n</i> = 210)	15 (7.1)	Ref.	Ref.
	Junior (<i>n</i> = 194)	17 (8.8)	1.25 (0.61–2.57)	0.94 (0.40–2.21)
	Senior (<i>n</i> = 186)	21 (11.3)	1.65 (0.83–3.31)	1.21 (0.54–2.73)
Place of origin	Local area (<i>n</i> = 419)	35 (8.4)	Ref.	Ref.
	Outside (<i>n</i> = 507)	43 (8.5)	1.02 (0.64–1.62)	0.74 (0.37–1.47)
Living arrangement	Alone (<i>n</i> = 537)	47 (8.8)	1.08 (0.67–1.73)	1.36 (0.68–2.69)
	With family/others (<i>n</i> = 379)	31 (8.2)	Ref.	Ref.
Body mass index at baseline	< 18.5 (<i>n</i> = 114)	11 (9.7)	1.30 (0.66–2.58)	1.18 (0.52–2.66)
	18.5–24.9 (<i>n</i> = 686)	52 (7.6)	Ref.	Ref.
	25–29.9 (<i>n</i> = 81)	10 (12.4)	1.72 (0.84–3.53)	1.79 (0.82–3.89)
	30–(<i>n</i> = 18)	3 (16.7)	2.43 (0.68–8.70)	2.15 (0.56–8.19)
Alcohol consumption	More than three times (<i>n</i> = 28)	5 (17.9)	2.42 (0.89–6.55)	2.60 (0.85–8.00)
	Less (<i>n</i> = 898)	74 (8.2)	Ref.	Ref.
Current smoking	Yes (<i>n</i> = 18)	1 (5.6)	0.63 (0.08–4.77)	0.45 (0.04–4.30)
	No (<i>n</i> = 908)	78 (8.6)	Ref.	Ref.
Exercise at baseline(METs*min/week)	Highest quartile (<i>n</i> = 212)	17 (8.0)	0.95 (0.48–1.91)	1.01 (0.48–2.13)
	Second highest quartile (<i>n</i> = 195)	17 (8.7)	1.05 (0.52–2.09)	1.03 (0.49–2.16)
	Second lowest quartile (<i>n</i> = 231)	21 (9.1)	1.09 (0.57–2.12)	0.87 (0.43–1.77)
	Lowest quartile (<i>n</i> = 215)	18 (8.4)	Ref.	Ref.
Daily use of SNS by voice or face	Yes (<i>n</i> = 147)	13 (8.8)	1.04 (0.56–1.93)	1.06 (0.53–2.11)
	No (<i>n</i> = 771)	66 (8.6)	Ref.	Ref.
One of the biggest worries	Financially insecure (<i>n</i> = 175)	16 (9.1)	3.16 (1.32–7.55)	3.48 (1.26–9.59)
	Academic performance (<i>n</i> = 219)	33 (15.1)	5.57 (2.51–12.33)	6.26 (2.48–15.82)
	Limited leisure activity (<i>n</i> = 259)	8 (3.1)	Ref.	Ref.
	Limited social support (<i>n</i> = 158)	14 (8.9)	3.05 (1.25–7.45)	3.06 (1.08–8.65)
	Limited physical activity (<i>n</i> = 115)	7 (6.1)	2.03 (0.72–5.75)	2.58 (0.82–8.10)
Presence of someone to consult about worries	Yes (<i>n</i> = 756)	53 (7.0)	0.41 (0.25–0.69)	0.47 (0.26–0.85)
	No (<i>n</i> = 169)	26 (15.4)	Ref.	Ref.

Summation which does not reach total number indicates missing in each category.

freshmen were not a high-risk group in our study because they appeared to communicate more with friends than the period at T2, suggesting that they were no longer socially isolated. Previous

studies (Fuse-Nagase et al., 2020; Mehus et al., 2021) agreed with our finding that freshmen may be exempt from psychological distress once they obtain social support. Furthermore, Horita et al.

(2021) investigated first-year Japanese students and reported that students' increased familiarity with and preparedness for the online learning environment may decrease academic distress over time, and, in turn, improve psychological well-being. As another vulnerable population, our previous study identified that being a woman was an important risk factor for depressive symptoms. According to a meta-analysis (Prati and Mancini, 2021), the role that gender plays in depression during the COVID-19 pandemic is not universally known; its impact depends on cross-cultural differences, compared with the international prevalence of depression (Fruehwirth et al., 2021; Ochnik et al., 2021). One local study in Japan (Habu et al., 2021) reported that the number of emergency dispatches related to suicide attempts increased in 2020 compared to the previous 2 years, especially among women and those aged 25–49 years. The authors concluded that this increase may be partly explained by hardships, such as economic losses or reduced social ties, during the COVID-19 outbreak. In our study, the prevalence of depressive symptoms was slightly higher in females than in males at both *T1* and *T2*; however, when a longitudinal design was used, gender did not have a significant effect. We found that females were more likely to have someone to consult about worries as a coping factor, compared to male students at *T2* (89% vs. 79%, $p < 0.001$). Hence, and in line with a previous study (Antonelli-Salgado et al., 2021), our findings regarding freshmen and women, previously known as vulnerable populations, suggest that the importance of social support during social isolation and subsequent loneliness during the pandemic, may adversely affect mental health.

Predictors of a new onset of a moderate degree of depressive symptoms and suicidal ideation include having someone to consult as a protective factor; thus, social support may be more important than ever during the COVID-19 pandemic. Suicide, although not a specific diagnosis, is the fourth-leading cause of death in 15–19-year-olds (World Health Organization, 2021). Given that many students with suicidal ideation do not seek treatment, implementing screening strategies to identify at-risk students and engaging them in treatment is critical (Kisch et al., 2005). Hopelessness is known as an independent risk factor for completed suicide, suicide attempts, and suicidal ideation (Kuo et al., 2004). Our finding that having someone to consult about worries is a coping factor may be used as a key intervention tool to decrease the likelihood of suicide. As face-to-face interactions and random encounters are limited due to social distancing measures, it may be useful to teach students coping strategies and stress management.

Alcohol use and smoking have been found to be risk factors for depression and suicide (Pompili et al., 2010; Barkhuizen et al., 2021). Alcohol abuse may lead to suicidal ideation through disinhibition, impulsiveness, and impaired judgment, but it may also be used as a medium to ease the distress associated with suicidal ideation (Pompili et al., 2010). In our previous study, we found that smoking and drinking were associated with an increased risk of depressive symptoms. Although smoking and drinking increased from *T1* to *T2*, the study's sample size was inadequate to report any significant effects.

Universities and researchers continue to discuss strategies for managing the psychological distress of students. Our findings may further inform research aiming to develop new hybrid mental health support for students in need; for example, traditional face-to-face interventions may be replaced with online intervention. As students need opportunities to interact and socialize in informal social settings, friendship, interaction, social support, and studying with others are useful tools that can positively impact their well-being and academic success. In addition, we should include campus strategy to decrease the numbers of COVID-19 infected cases. In this regard, vaccine plays a central role as primary prevention strategy but the uptake of COVID-19 has been reported to be very low especially among the younger generation. We have recently conducted a survey of vaccine intention among university students (Miyachi et al., 2022) and concluded that the public health strategy to improve students' vaccine uptake requires providing accurate information on vaccine safety and efficacy while removing any barriers to vaccination (i.e., easy vaccine access).

Limitations

There are limitations to this study. First, our participants belonged to a national university, inducing limited generalizability. However, this limitation may be countered by the large sample size for a longitudinal design. Second, our study was based on voluntary participation; students who were interested in mental health surveys were more likely to participate in the study, while students with depressive symptoms may have found it difficult to answer a multiple-item questionnaire or may not have wanted to respond to the survey. In addition, because our survey only allowed students who participated in two consecutive years, those who graduated in the previous year were not technically able to participate. However, attrition analyses demonstrated that the prevalence of depression and suicidal ideation seemed to be largely proportional between enrollments (*T1* and *T2* participants) and those lost to follow-ups. Third, mental health was assessed using the PHQ-9 scale exclusively; underlying psychiatric illnesses were not measured. An individual data meta-analysis of 9,242 participants from 44 primary studies (Levis et al., 2020) reports that PHQ-9 scores do not accurately estimate depression prevalence and PHQ-9 ≥ 10 substantially overestimates depression prevalence. Likewise, the PHQ-9 suicide item, a single response item used to assess both passive thoughts of death and the desire for self-injury, may yield high false-positive rates. Thus, caution should be exercised in interpreting the results.

Conclusion

Longitudinal findings demonstrate how the COVID-19 pandemic has impacted students' mental health. Our results indicate that socioenvironmental factors may determine

depressive symptoms of university students, requiring urgent interventions to combat students' psychological distress.

Data availability statement

The original contributions presented in the study are included in the article/Supplementary material, further inquiries can be directed to the corresponding author.

Ethics statement

The studies involving human participants were reviewed and approved by Akita University ethical committee. The ethics committee waived the requirement of written informed consent for participation.

Author contributions

KN, KO, KM, and FY contributed to conception and design of the study. JH, KO, and FY collected data. KN, TY, and EM performed the statistical analyses. KN, KM, and MF interpreted psychological results. KN wrote the first draft of the manuscript. All authors took responsibility for the integrity of the data and the accuracy of the data analysis. All authors contributed to the article and approved the submitted version.

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Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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Supplementary material

The Supplementary material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2022.863300/full#supplementary-material>

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