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Impact of Economic Deterioration on Mental Health During the COVID-19 Pandemic in Japan: Focus on the Protective Role of Social Support and Detrimental Effects of Negative Interactions

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Impact of Economic Deterioration on Mental Health During the COVID-19 Pandemic in Japan: Focus on the Protective Role of Social Support and Detrimental Effects of Negative Interactions

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Abstract

Background: Reports have indicated that the socioeconomic impact of the spread of COVID-19 infection has severely impacted the mental health of individuals. However, it is unclear how the impact of deteriorating economic conditions on mental health varies with the amount of social support and negative interactions (eg, criticism and excessive demands from others) individuals have.

Objective: This study tested two hypotheses, focusing on the association between the worsening economic status due to COVID-19 and mental health. Hypothesis 1: The negative impact on mental health from worsening economic conditions caused by the spread of COVID-19 infection is exacerbated by the amount of social support an individual receives. Hypothesis 2: The negative impact on mental health from a deteriorating economic situation due to the spread of COVID-19 is exacerbated by a greater number of negative interactions.

Methods: Web-based surveillance was conducted by an Internet research company in Japan. The company recruited 3500 individuals from their active panels from June to July 2020; 250 men and 250 women were recruited for each of the following age groups—primary school students, 20s, 30s, 40s, 50s, 60s, and 70s. The analysis was conducted on men and women in their 20s to 50s (n=1549). The objective variable was measured using the K6 scale for psychological distress. The explanatory variable, economic deterioration due to COVID-19, was defined as economic deterioration due to COVID-19 if respondents indicated that their income had decreased compared to before the spread of COVID-19. In addition, social support and negative interaction scales were used. Logistic regression analysis was used, and the interaction between economic deterioration due to COVID-19 and social support and the interaction between economic deterioration due to COVID-19 and negative interaction were added sequentially to the model; a likelihood ratio test was used to assess the most improved model.

Result: In the significantly improved model, the interaction between economic deterioration due to COVID-19 and social support was significantly associated with K6 scores (Odds ratio 0.909, 95% CI 0.829-0.996). The average marginal effect of economic deterioration due to COVID-19 was calculated and the results revealed that social support scores ranging from 4 to 10 were statistically significant.

Conclusion: The negative effect of COVID-19-induced economic deterioration on mental health tended to be stronger with less support. Based on these results, Hypothesis 1 was supported.

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Introduction

The spread of COVID-19 forced people to change their lifestyles, raising significant concerns about the deterioration of their mental health. During this period, individuals who experienced unemployment or had a history of chronic or mental illnesses showed a tendency toward worsening mental health [1,2,3,4,5]. Among these issues, problems arising from interpersonal relationship restrictions such as social distancing were highlighted during the pandemic. These restrictions not only reduced interpersonal networks and induced feelings of loneliness, but also decreased the support received from others, which affected people's mental health [1,6]. For example, mothers raising children experienced increased stress due to the disruption of interactions with grandparents, who are a source of support, as contact with them was restricted [2]. However, in situations where face-to-face support was limited, people established ways to receive support through online services and social media. Furthermore, non-face-to-face social support, like face-to-face support, has been reported to have positive effects on mental health, reaffirming the previously recognized benefits of social support [7] .

Previous studies have demonstrated that social support has a significant impact on people's mental health [6,8,9,10], and serves as a buffer against stress arising from experiencing negative events [11,12,13,14]. Support through online services has proven to be effective, and the buffering effect of support has also been confirmed during the COVID-19 pandemic. For example, studies have reported that social support helped suppress feelings of loneliness [15,16], alleviated anxiety concerning the pandemic among pregnant women [17], and mitigated the impact of increased work-related stress on mental health during the pandemic [18].

These findings suggest that the negative impact of mental health due to adverse events arising from the COVID-19 pandemic can be alleviated through social support as a protective factor. These buffer effects highlight the necessity for policy assistance for individuals who lack support and struggle with adversity. In particular, identifying the factors that influence mental health and aid in recovery is expected to contribute to research that provides preventive measures for future pandemics [4].

This study analyzed how the effects of support during the COVID-19 pandemic manifested in Japan, a country with a high suicide rate. Even before the pandemic, Japan had a notably high suicide rate, although the number of suicides had declined before the outbreak. However, following the spread of COVID-19, the suicide rate began to rise again [19]. Globally, the socioeconomic downturn caused by the pandemic has been a contributing factor to the increase in suicides, with issues such as unemployment, economic insecurity, and poverty causing serious concern [2,3,5] .

Previous research further indicates that events such as income reduction and lack of support during the pandemic negatively impacted individuals' mental health [20]. However, it remains unclear whether support can mitigate the impact of negative events such as income reduction. To investigate this, it is essential to elucidate how the negative impact of economic deterioration due to the pandemic on mental health varies according to the amount of support received.

This study aimed to fill this gap by examining the buffering effects of support on mental health during the economic downturn caused by the COVID-19 pandemic in Japan. Understanding these dynamics can provide critical insights into how social support acts as a protective factor and inform policies to assist individuals when facing adversity.

However, connections with others do not necessarily benefit all individuals. Some studies that examined the impact of interpersonal relationships have focused on negative relationships and cautioned against simply increasing or maintaining these connections. These studies are crucial although fewer in number compared to studies highlighting positive interpersonal functions such as social support. According to Lincoln's review, negative interactions (negative social support, problematic support, and negative social exchange), such as criticism or excessive demands from others, can harm individuals' mental health [21]. Furthermore, it has been argued that the negative

effects of such interactions are greater than the positive effects of support. Several studies conducted during the COVID-19 pandemic have already demonstrated the negative impact of such interactions on mental health [22,23]. Therefore, it is anticipated that the damaging impact on mental health resulting from adverse events caused by COVID-19 may be exacerbated by the number of negative interactions.

Based on the above considerations, this study aimed to identify the interpersonal factors that exacerbate the negative impact of the COVID-19 pandemic on mental health. Consequently, the following two hypotheses were tested:

Hypothesis 1: The negative impact of economic deterioration due to the COVID-19 pandemic on mental health worsens as the amount of support decreases.

Hypothesis 2: The negative impact of economic deterioration due to the COVID-19 pandemic on mental health worsens as negative interactions increase.

By examining these hypotheses, this study sought to provide an understanding of how both the presence and absence of social support and the presence of negative interactions influence mental health outcomes during the COVID-19 pandemic. This understanding is critical for developing targeted interventions and policies to support mental health during similar crises.

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Methods

Data Source

Web-based surveillance was conducted through an Internet research company in Japan, Cross Marketing Inc. Cross Marketing Inc., along with its partner companies, maintains active panels comprising over 5 million individuals who have registered their sociodemographic information in the company's database and responded to at least one survey within the past year. From June to July 2020, the company recruited 3,500 individuals from these active panels. Specifically, 250 men and 250 women were recruited from each of the following age groups: elementary school students and individuals in their 20s, 30s, 40s, 50s, 60s, and 70s.

In this study, the deterioration of economic conditions was a key variable. To analyze the impact of worsening economic conditions, it was necessary to focus on groups that experienced unemployment or income reduction. Therefore, individuals in their 60s and 70s, who are more likely to be unemployed or retired, were excluded from the analysis. The study focused on men and women in their 20s to 50s (n=2000).

Measurements

To screen for mental health issues, this study used the K6 scale as the dependent variable. The K6 scale measures psychological distress over the past 30 days. It consists of six items rated on a 5-point scale, with total scores ranging from 0 to 24. Higher scores indicate greater psychological distress [24]. Furukawa et al. validated the reliability of the K6 scale in the Japanese population [25]. Following Furukawa et al., this study uses a cutoff score of K6≥9 for screening mood and anxiety disorders and incorporates this in the analysis.

The primary independent variables used for hypothesis testing were economic deterioration due to COVID-19, social support, and negative interactions. Economic deterioration due to COVID-19 was measured using the question: "How has your income (total pre-tax income from work and non-work sources) changed as of April compared to before the COVID-19 pandemic? Please select the option that best describes your situation. If your salary is yet to be confirmed (eg, not yet deposited), please answer based on your expectations." The responses were as follows: 1 = Increased (expected to increase), 2 = Slightly increased (expected to slightly increase), 3 = Almost unchanged, 4 = Slightly decreased (expected to slightly decrease), and 5 = Decreased (expected to decrease). The distribution of responses were as follows: 1 (n=21), 2 (n=40), 3 (n=949), 4 (n=221), and 5 (n=318). Owing to the small number of cases in Categories 1 and 2, these were combined with Category 3 and recoded as 0. Categories 4 and 5 were combined and recoded as 1, yielding binary variables. Additionally, the correlation between economic deterioration due to COVID-19 and household income (a continuous variable) was weak (r=0.101).

Social support was measured using a 4-item, 4-point scale, with total scores ranging from 4 to 16, with higher scores indicating greater social support. The items were, “How much do your friends really care about you?”, “How much do they understand the way you feel about things?”, “How much can you rely on them for help if you have a serious problem?”, and “How much can you open up to them if you need to talk about your worries?”. The response options were as follows: 1 = Not at all, 2 = A little, 3 = Some, and 4 = A lot [26,27].

Negative interactions were measured using a 4-item, 4-point scale, with total scores ranging from 4 to 16, with higher scores indicating greater negative interactions. The items were, “How often do your friends make too many demands on you?”, “How often do they criticize you?”, “How often do they let you down when you are counting on them?”, and “How often do they get on your nerves?”. The response options were, 1 = Never, 2 = Rarely, 3 = Sometimes, and 4 = Often [26,27].

The control variables used in this study are sex (1 = female, 0 = male), age, marital status (1 =

married, 0 = single, divorced, or widowed), education level (dummy variables for university/graduate school degree, junior college/technical college/specialized training school degree, high school/junior high school degree), last year's household income (log-transformed for analysis), presence of chronic illness (1 = yes, 0 = no), residential area (1 = urban, 0 = rural), and the Japanese version of the Big Five personality traits (extraversion, neuroticism, openness, conscientiousness, and agreeableness) [28].

Ethical Considerations

This study was approved by the ethics committees of the Kyoto University of Advanced Science (KUAS no.20-3) and the National Institutes of Biomedical Innovation, Health, and Nutrition (NIBIOHN no. 202). An information sheet was presented to participants on the online survey landing page. Only those who confirmed that they had read the information sheet and consented to participate were included.

Statistical Analyses

Initially, a logistic regression model was applied to evaluate the association between economic deterioration due to COVID-19, social support, negative interaction, and mental health, controlling for sex, age, marital status, education level, last year's household income, presence of chronic illness, residential area, and Big Five personality traits. Additionally, the interaction terms between economic deterioration due to COVID-19 and social support, as well as between economic deterioration due to COVID-19 and negative interaction, were sequentially added to the model. Likelihood ratio tests were conducted to assess the most improved models. Statistical analyses were performed using R version 4.2.2. Listwise deletion was used for data with missing values, resulting in a final sample of 1,549 individuals.

Results

Table 1. Descriptive statistics.

		n	%			n	%	mean	SD	range	Cronbach's Alpha
Gender				Chronic Disease							
	Male	820	53.0%		Yes	393	25.4%				
	Female	725	47.0%		No	1152	74.6%				
Age				Residence Area							
	20s	366	23.7%		Urban	934	60.5%				
	30s	382	24.7%		Rural	611	39.5%				
	40s	401	26.0%	Big Five							
	50s	396	25.6%		Extraversion			47.73	10.42	12-84	0.89
Marital Status					Neuroticism			48.97	13.17	12-84	0.93
	Married	828	53.6%		Openness to Experience			45.96	10.60	12-84	0.91
	Unmarried/Divorced/Separated	717	46.4%		Conscientiousness			45.40	9.66	12-84	0.84
Educational Background					Agreeableness			51.91	9.20	12-84	0.83
	University/Graduate School	810	52.4%	Economic Deterioration Due to COVID-19							
	Junior College/Technical College/Vocational School	339	21.9%		Worsened	537	34.8%				
	High School/Middle School	396	25.6%		Not Worsened	1008	65.2%				
Household Income				Social Support				9.53	2.91	4-16	0.90
	Less than 2 million yen	169	10.9%	Negative Interaction				8.62	2.48	4-16	0.83
	2 to 3.99 million yen	357	23.1%								
	4 to 6.99 million yen	493	31.9%								
	7 to 9.99 million yen	316	20.5%								
	Over 10 million yen	210	13.5%								

Table 2. Results of binomial logistic regression.

	Model1[a]		
	Odds[b] ratio	[95% CI]	P value
Female (vs Male)	0.956	[0.731 – 1.250]	0.742
Age 20s (vs 50s)	2.919	[1.922 – 4.434]	< 0.000
Age 30s (vs 50s)	1.962	[1.326 – 2.903]	< 0.000
Age 40s (vs 50s)	1.434	[0.987 – 2.082]	0.058
Married (vs Unmarried/Divorced/Separated)	1.273	[0.938 – 1.726]	0.121
University/Graduate School (vs High School/Middle School)	0.863	[0.633 – 1.178]	0.353
Junior College/Technical College/Vocational School (vs High School/Middle School)	0.977	[0.682 – 1.399]	0.899
Household Income	0.763	[0.642 – 0.908]	0.002
No Chronic Disease (vs Yes)	0.580	[0.434 – 0.775]	< 0.000
Urban (vs Rural)	0.872	[0.672 – 1.132]	0.303
Big Five Extraversion	1.010	[0.994 – 1.026]	0.210
Big Five Neuroticism	1.053	[1.04 – 1.066]	< 0.000
Big Five Openness to Experience	0.987	[0.973 – 1.002]	0.083
Big Five Conscientiousness	0.991	[0.975 – 1.007]	0.255
Big Five Agreeableness	0.984	[0.968 – 1.000]	0.054
Economic Deterioration Due to COVID -19 (vs Not Worsened)	1.579	[1.219 – 2.045]	< 0.000
Social Support	0.965	[0.919 – 1.013]	0.152
Negative Interaction	1.212	[1.149 – 1.279]	< 0.000
Nagelkerke	0.240		
AIC	1552.787		
N	1545		

[a]Model1: This model did not include interaction terms.

[b]Odds ratio: adjusted odds ratio.

Table 1 presents the descriptive statistics. For categorical variables, the table shows numbers (n) and percentages. For continuous variables, the table displays the means and standard deviations.

The results of the logistic regression analysis evaluating the association between mental health and economic deterioration due to COVID-19, social support, and negative interactions are presented.Model 1 evaluates the association between economic deterioration due to COVID-19, social support, and negative interactions (Table 2). Economic deterioration due to COVID-19 (Odds ratio 1.579, 95% CI 1.219-2.045) and negative interactions (Odds ratio 1.212, 95% CI 1.149-1.279) were significantly associated with poor mental health.

Model 2 included an interaction term between economic deterioration due to COVID-19 and social

support; Model 3 included an interaction term between economic deterioration due to COVID-19 and negative interaction, and Model 4 included both interaction terms (Table 3). In this analysis, social support and negative interactions were centered. Focusing on the results of the interaction terms, only the interaction between economic deterioration due to COVID-19 and social support was significant in Model 2 (Odds ratio 0.909, 95% CI 0.830-0.996) and Model 4 (Odds ratio 0.909, 95% CI 0.829-0.996).

Furthermore, likelihood ratio tests were conducted to assess the degree of improvement in Models 1, 2, 3, and 4 (Table 4). The results indicated that Model 2, which included the interaction term between economic deterioration due to COVID-19 and social support, significantly improved (P=0.040). Model 2 had the lowest Akaike information criterion value (AIC=1550.570).

Finally, to examine the results of the interaction term in Model 2, the average marginal effects of economic deterioration due to COVID-19 were calculated and visualized (Figure 1). As demonstrated by the 95% CI, the average marginal effect was significant when the number of social support items ranged from 4 to 10. This suggests that the negative impact of economic deterioration due to COVID-19 on mental health is stronger when the level of social support is low.

Table 3. Results of binomial logistic regression including interaction terms.

	Model2[a]				Model3[b]				Model4[c]			
	Odds ratio[d]	[95% CI]		P value	Odds ratio[d]	[95% CI]		P value	Odds ratio[d]	[95% CI]		P value
Female (vs Male)	0.957	0.732	1.252	0.749	0.956	0.732	1.250	0.744	0.957	0.732	1.252	0.749
Age 20s (vs 50s)	2.929	1.927	4.453	< 0.000	2.921	1.923	4.437	< 0.000	2.929	1.926	4.452	< 0.000
Age 30s (vs 50s)	1.963	1.326	2.905	0.001	1.963	1.327	2.904	0.001	1.963	1.326	2.905	0.001
Age 40s (vs 50s)	1.427	0.982	2.074	0.062	1.434	0.987	2.082	0.058	1.427	0.982	2.074	0.062
Married (vs Unmarried/Divorced/Separated)	1.266	0.933	1.718	0.130	1.272	0.938	1.726	0.121	1.266	0.933	1.718	0.130
University/Graduate School (vs High School/Middle School)	0.865	0.633	1.181	0.360	0.864	0.633	1.179	0.357	0.864	0.633	1.181	0.359
Junior College/Technical College/Vocational School (vs High School/Middle School)	0.981	0.685	1.405	0.916	0.978	0.683	1.402	0.906	0.980	0.684	1.405	0.913
Household Income	0.772	0.648	0.919	0.004	0.764	0.642	0.909	0.002	0.772	0.648	0.919	0.004
No Chronic Disease (vs Yes)	0.578	0.432	0.773	< 0.000	0.580	0.434	0.775	< 0.000	0.578	0.432	0.773	< 0.000
Urban (vs Rural)	0.867	0.668	1.126	0.286	0.871	0.671	1.131	0.301	0.867	0.668	1.127	0.287
Big Five Extraversion	1.010	0.994	1.026	0.214	1.010	0.994	1.026	0.211	1.010	0.994	1.026	0.214
Big Five Neuroticism	1.053	1.040	1.066	< 0.000	1.053	1.040	1.066	< 0.000	1.053	1.040	1.066	< 0.000
Big Five Openness to Experience	0.987	0.973	1.002	0.085	0.987	0.973	1.002	0.083	0.987	0.973	1.002	0.085
Big Five Conscientiousness	0.991	0.975	1.007	0.256	0.991	0.975	1.007	0.257	0.991	0.975	1.007	0.255
Big Five Agreeableness	0.984	0.967	1.000	0.051	0.984	0.968	1.000	0.054	0.984	0.967	1.000	0.052
Economic Deterioration Due to Covid-19 (vs Not Worsened)	1.569	1.210	2.034	0.001	1.584	1.218	2.061	0.001	1.566	1.203	2.041	< 0.000
Social Support	1.002	0.943	1.065	0.949	0.965	0.919	1.013	0.153	1.002	0.943	1.065	0.948
Negative Interaction	1.216	1.152	1.283	< 0.000	1.216	1.135	1.302	< 0.000	1.214	1.134	1.300	< 0.000
Economic Deterioration Due to COVID -19 × Social Support	0.909	0.830	0.996	0.041					0.909	0.829	0.996	0.041
Economic Deterioration Due to COVID-19 × Negative Interaction					0.993	0.892	1.105	0.895	1.003	0.900	1.118	0.957
Nagelkerke	0.243				0.240				0.243			
AIC	1550.570				1554.770				1552.567			
N	1545				1545				1545			

[a]Model2: This model included an interaction term between economic deterioration due to COVID-19 and social support.

[b]Model3: This model included an interaction term between economic deterioration due to COVID-19 and negative interaction.

[c]Model4: This model included an interaction term between economic deterioration due to COVID-19 and social support, and between economic deterioration due to COVID-19 and negative interaction.

[d]Odds ratio: adjusted odds ratio.

Table 4. Likelihood ratio test for models including interaction effects.

	Δd[a]	Δdf[b]	P value
Model2	4.217	1	0.040
Model3	0.017	1	0.894
Model4	4.22	2	0.121

[a]ΔD : the difference in Deviance from Model1.

[b]Δdf : the difference in degrees of freedom from Model1.

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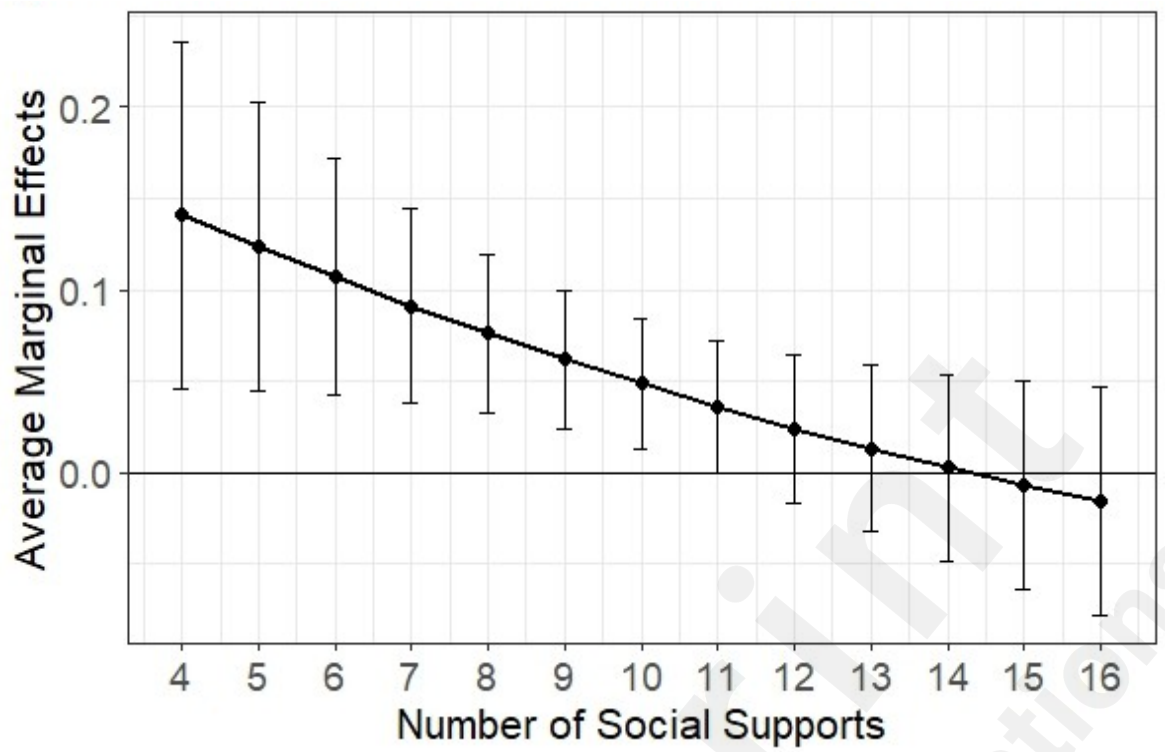

Figure 1 Average marginal effects of economic deterioration due to COVID-19 with 95% confidence intervals (CI).

Discussion

This study analyzed how the negative impact of events triggered by the COVID-19 pandemic on mental health varied depending on qualitative and quantitative differences in interpersonal relationships. In Japan, where the suicide rate was notably high, even before COVID-19, there had been a decline in the number of suicides prior to the pandemic. However, following the spread of COVID-19, the trend reversed, and the number of suicides began to increase again [19]. One contributing factor was the socioeconomic downturn caused by the pandemic [2,3,5]. Consistent with this, the results of this study confirmed that economic deterioration due to COVID-19 negatively impacts mental health.

A key finding of this study was that the negative impact of economic deterioration due to COVID-19 on mental health tended to be stronger when social support was low, thus supporting Hypothesis 1. Previous research has shown that income reduction and a lack of support during the COVID-19 pandemic each negatively affected mental health [20]. However, analyses have not focused on the interaction between economic deterioration and the amount of support available. As many previous studies on social support have suggested [11,12,13,14], this study confirms that stress arising from negative events during the COVID-19 pandemic is influenced by the amount of support an individual receives.

These results imply that social support is particularly important for individuals suffering from negative events, such as economic deterioration, during the pandemic. The use of online services for counseling support [15,16] may be worth considering as a preventive measure against future pandemics.

However, it has been argued that the damaging effects of negative interactions are greater than those of support [21]. Unlike previous studies [22,23], this study focuses on the interaction between adverse events, specifically economic deterioration, and negative interactions. The results reveal that

this interaction term is insignificant, indicating that negative interactions do not significantly amplify the negative impact of economic deterioration. Nevertheless, as shown in Model 2, the effect of the negative interaction alone was significant (Odds ratio 1.216, 95% CI 1.152-1.283). This finding is consistent with previous research [22,23] and suggests that the number of negative interactions tend to adversely affect mental health.

During the COVID-19 pandemic, people were forced to limit their contact and had fewer opportunities to communicate. The fact that these limited interactions were negative suggests that such interactions could further deteriorate mental health. This emphasizes the importance of considering not only the presence of social support but also the nature of interpersonal interactions when addressing mental health issues during such crises.

Limitations

This study has several limitations. First, the survey was not based on random sampling, but rather targeted monitors who were available to participate via the Internet. Those who did not use the Internet were excluded from this study. Therefore, the results of this study do not reflect the characteristics of the Japanese population. Second, the cross-sectional design limited the ability to argue for causal relationships. Future studies should adopt longitudinal designs using panel data or experimental designs to establish causal relationships.

Conclusion

This study found that the negative impact of economic deterioration due to the COVID-19 pandemic on mental health was stronger when social support was low. In addition, negative interactions do not significantly amplify the negative impacts of economic deterioration. To mitigate the negative impact of economic deterioration due to the COVID-19 pandemic on mental health, it is imperative to enhance interactions with trusted partners. It is recommended that online interactions must be actively promoted and increased.

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Supplementary Files

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Figures

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	n	%		n	%	mean	SD	range	Cronbach's Alpha
Gender			Chronic Disease						
Male	820	53.0%	Yes	393	25.4%				
Female	725	47.0%	No	1152	74.6%				
Age			Residence Area						
20s	366	23.7%	Urban	934	60.5%				
30s	382	24.7%	Rural	611	39.5%				
40s	401	26.0%	Big Five						
50s	396	25.6%	Extraversion			47.73	10.42	12-84	0.89
Marital Status			Neuroticism			48.97	13.17	12-84	0.93
Married	828	53.6%	Openness to Experience			45.96	10.60	12-84	0.91
Unmarried/Divorced/Separated	717	46.4%	Conscientiousness			45.40	9.66	12-84	0.84
Educational Background			Agreeableness			51.91	9.20	12-84	0.83
University/Graduate School	810	52.4%	Economic Deterioration Due to COVID-19						
Junior College/Technical College/Vocational School	339	21.9%	Worsened	537	34.8%				
High School/Middle School	396	25.6%	Not Worsened	1008	65.2%				
Household Income			Social Support			9.53	2.91	4-16	0.90
Less than 2 million yen	169	10.9%	Negative Interaction			8.62	2.48	4-16	0.83
2 to 3.99 million yen	357	23.1%							
4 to 6.99 million yen	493	31.9%							
7 to 9.99 million yen	316	20.5%							
Over 10 million yen	210	13.5%							

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	Model1[a]		
	Odds[b] ratio	[95% CI]	P value
Female (vs Male)	0.956	[0.731 - 1.250]	0.742
Age 20s (vs 50s)	2.919	[1.922 - 4.434]	< 0.000
Age 30s (vs 50s)	1.962	[1.326 - 2.903]	< 0.000
Age 40s (vs 50s)	1.434	[0.987 - 2.082]	0.058
Married (vs Unmarried/Divorced/Separated)	1.273	[0.938 - 1.726]	0.121
University/Graduate School (vs High School/Middle School)	0.863	[0.633 - 1.178]	0.353
Junior College/Technical College/Vocational School (vs High School/Middle School)	0.977	[0.682 - 1.399]	0.899
Household Income	0.763	[0.642 - 0.908]	0.002
No Chronic Disease (vs Yes)	0.580	[0.434 - 0.775]	< 0.000
Urban (vs Rural)	0.872	[0.672 - 1.132]	0.303
Big Five Extraversion	1.010	[0.994 - 1.026]	0.210
Big Five Neuroticism	1.053	[1.04 - 1.066]	< 0.000
Big Five Openness to Experience	0.987	[0.973 - 1.002]	0.083
Big Five Conscientiousness	0.991	[0.975 - 1.007]	0.255
Big Five Agreeableness	0.984	[0.968 - 1.000]	0.054
Economic Deterioration Due to COVID -19 (vs Not Worsened)	1.579	[1.219 - 2.045]	< 0.000
Social Support	0.965	[0.919 - 1.013]	0.152
Negative Interaction	1.212	[1.149 - 1.279]	< 0.000
Nagelkerke	0.240		
AIC	1552.787		
N	1545		

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	Model2[a]			Model3[b]			Model4[c]		
	Odds ratio[d]	[95% CI]	P value	Odds ratio[d]	[95% CI]	P value	Odds ratio[d]	[95% CI]	P value
Female (vs Male)	0.957	[0.732 - 1.252]	0.749	0.956	[0.732 - 1.250]	0.744	0.957	[0.732 - 1.252]	0.749
Age 20s (vs 50s)	2.929	[1.927 - 4.453]	< 0.000	2.921	[1.923 - 4.437]	< 0.000	2.929	[1.926 - 4.452]	< 0.000
Age 30s (vs 50s)	1.963	[1.326 - 2.905]	0.001	1.963	[1.327 - 2.904]	0.001	1.963	[1.326 - 2.905]	0.001
Age 40s (vs 50s)	1.427	[0.982 - 2.074]	0.062	1.434	[0.987 - 2.082]	0.058	1.427	[0.982 - 2.074]	0.062
Married (vs Unmarried/Divorced/Separated)	1.266	[0.933 - 1.718]	0.130	1.272	[0.938 - 1.726]	0.121	1.266	[0.933 - 1.718]	0.130
University/Graduate School (vs High School/Middle School)	0.865	[0.633 - 1.181]	0.360	0.864	[0.633 - 1.179]	0.357	0.864	[0.633 - 1.181]	0.359
Junior College/Technical College/Vocational School (vs High School/Middle School)	0.981	[0.685 - 1.405]	0.916	0.978	[0.683 - 1.402]	0.906	0.980	[0.684 - 1.405]	0.913
Household Income	0.772	[0.648 - 0.919]	0.004	0.764	[0.642 - 0.909]	0.002	0.772	[0.648 - 0.919]	0.004
No Chronic Disease (vs Yes)	0.578	[0.432 - 0.773]	< 0.000	0.580	[0.434 - 0.775]	< 0.000	0.578	[0.432 - 0.773]	< 0.000
Urban (vs Rural)	0.867	[0.668 - 1.126]	0.286	0.871	[0.671 - 1.131]	0.301	0.867	[0.668 - 1.127]	0.287
Big Five Extraversion	1.010	[0.994 - 1.026]	0.214	1.010	[0.994 - 1.026]	0.211	1.010	[0.994 - 1.026]	0.214
Big Five Neuroticism	1.053	[1.040 - 1.066]	< 0.000	1.053	[1.040 - 1.066]	< 0.000	1.053	[1.040 - 1.066]	< 0.000
Big Five Openness to Experience	0.987	[0.973 - 1.002]	0.085	0.987	[0.973 - 1.002]	0.083	0.987	[0.973 - 1.002]	0.085
Big Five Conscientiousness	0.991	[0.975 - 1.007]	0.256	0.991	[0.975 - 1.007]	0.257	0.991	[0.975 - 1.007]	0.255
Big Five Agreeableness	0.984	[0.967 - 1.000]	0.051	0.984	[0.968 - 1.000]	0.054	0.984	[0.967 - 1.000]	0.052
Economic Deterioration Due to Covid-19 (vs Not Worsened)	1.589	[1.210 - 2.034]	0.001	1.584	[1.208 - 2.061]	0.001	1.566	[1.203 - 2.041]	< 0.000
Social Support	1.002	[0.943 - 1.065]	0.949	0.965	[0.919 1.013]	0.153	1.002	[0.943 - 1.065]	0.948
Negative Interaction	1.216	[1.132 - 1.283]	< 0.000	1.216	[1.135 - 1.302]	< 0.000	1.214	[1.134 - 1.300]	< 0.000
Economic Deterioration Due to COVID-19 × Social Support	0.909	[0.830 0.996]	0.041				0.909	[0.829 - 0.996]	0.041
Economic Deterioration Due to COVID-19 × Negative Interaction				0.993	[0.892 - 1.105]	0.885	1.003	[0.900 - 1.118]	0.957
Nagelkerke	0.243			0.240			0.243		
AIC	1550.570			1554.770			1552.567		
N	1545			1545			1545		

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	Δd^{a}	Δdf^{b}	P value
Model2	4.217	1	0.040
Model3	0.017	1	0.894
Model4	4.22	2	0.121

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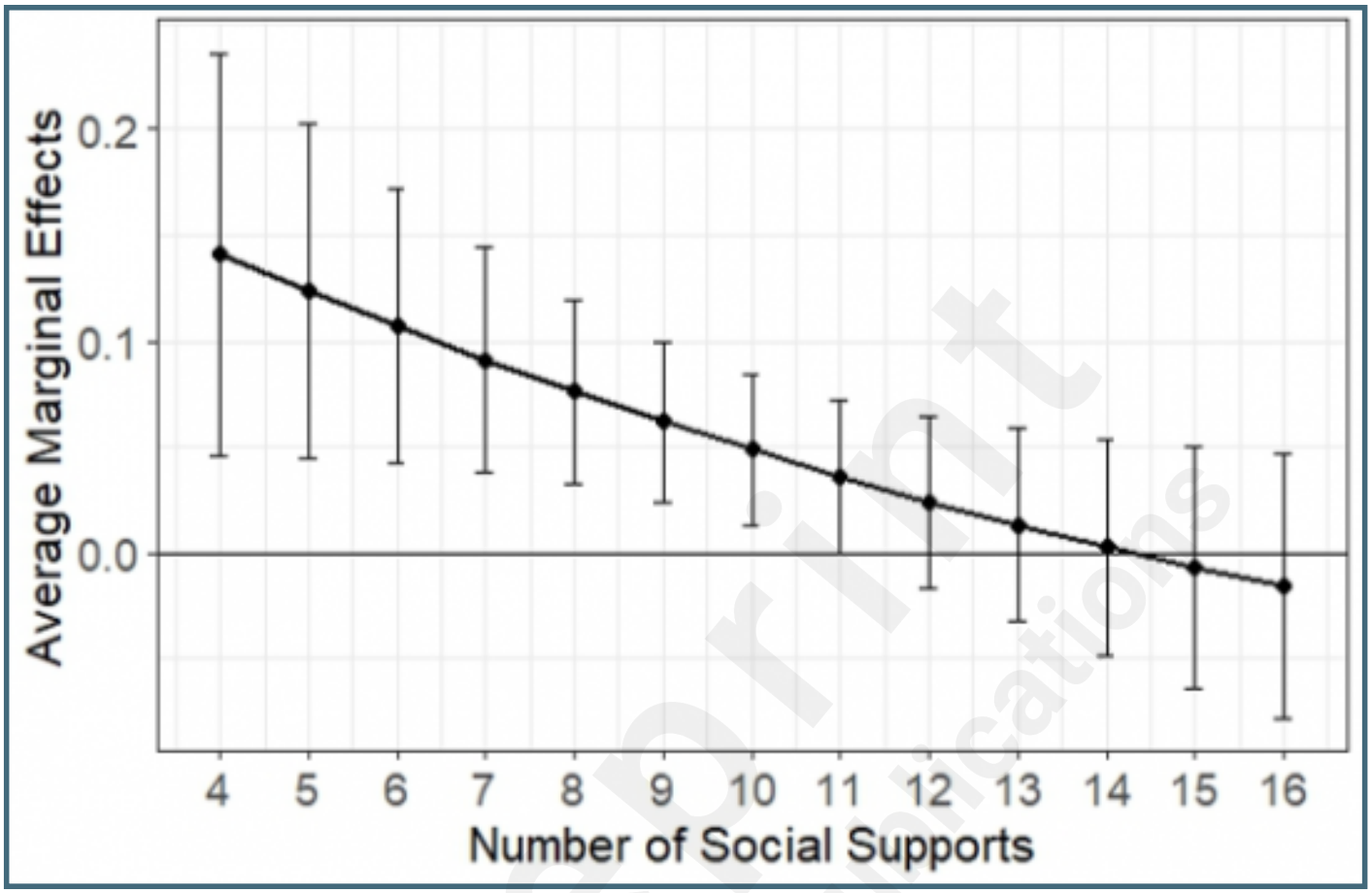

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