

## Original Research

# The Effect of Face-to-Face and Mediated Communication on Younger and Middle-Aged Adults' Mental Health during the Covid-19 Pandemic: A Longitudinal Panel Analysis

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**ABSTRACT**

The Covid-19 pandemic has profoundly changed the modes of communication and social interactions. This study examines the effects of face-to-face and mediated communication on mental health and the moderating role of social support for younger and middle-aged adults following the Covid-19 pandemic. The longitudinal panel survey was conducted through a specialized survey agency across three periods: the spread of the Omicron variant (T1), the release of social distancing measures (T2), and the normalization phase (T3). The findings indicate that for younger adults, face-to-face communication during T2 reduced anxiety and depressive symptoms. Additionally, during T2, social support moderated the association between mediated communication and anxiety for both younger and middle-aged adults. The results highlight the significance of social support as a protective factor that mitigates the mental health impacts of mediated communication during specific phases of the pandemic. The study offers theoretical and practical implications, suggesting mental health support policies, relevant programs, and interventions tailored to younger and middle-aged adults following the pandemic.

**KEYWORDS**

covid-19, face-to-face communication, mediated communication, mental health, social support

Covid-19 has transformed people's lives, changing the ways of social interaction and communication. With the spread of Covid 19, the implementation of safety measures, including social distancing, was enacted to minimize face-to-face interactions (CDC, 2023), accelerating the use of mediated communication that includes online workplace meetings, the metaverse, social media, and specialized programs accessed through mobile devices or platforms. As a result, communication channels became essential for obtaining information,

entertainment, learning, daily communication, and connecting across various personal and professional activities (A. Chen et al., 2023). Social and forced physical distancing have influenced relationships and communication channels, resulting in psychological and relational outcomes of isolation and separateness (Brooks et al., 2020). Prior research has shown a rise in individuals experiencing depression, loneliness, or adverse psychological effects on mental health (Kovacs et al., 2021). Previous research revealed lower psychological well-being and an increase in anxiety, depression, and psychological distress across various population groups due to the Covid-19 pandemic (Gaggero et al., 2022; Vindegaard & Benros, 2020). Especially in Korea, during the pandemic, the increase in depression levels was found to be the highest when compared to the period before the pandemic. Depression levels among older people were significantly higher compared to younger adults and middle-aged adults (Kim et al., 2022). On the other hand, the highest levels of anxiety were observed among younger adults with the highest levels of education (S. J. Jung et al., 2020).

Studies that examined continuous changes in mental health symptoms (e.g., anxiety and depression) were considered eligible. Prior research has commonly employed anxiety and depression as empirically distinct and validated multi-item measures of mental health (Daly & Robinson, 2022). Park et al. (2012) validated the Korean version of the General Health Questionnaire-12 (GHQ-12) as a reliable tool for assessing anxiety and depression among Korean adults, demonstrating its applicability for measuring mental health (Park et al., 2012). Similarly, Hawes et al. (2022) explored the influence of Covid-19 on anxiety and depression, while Lam and Peng (2010) examined how compulsive Internet use influenced anxiety and depression in adolescents. In a longitudinal study, Wetherell et al. (2001) concluded that a model distinguishing between anxiety and depressive symptoms provided a

better fit. Cross-sectional factor analyses have also supported the distinction between anxiety and depression, particularly in older populations (Spinhoven et al., 1997; Wetherell & Areán, 1997). Building on these findings, this study explores the effect of communication modes and the moderating role of social support on the dual outcomes of anxiety and depressive symptoms.

Mental health and well-being research explored the connections between social support and psychological and physical outcomes (Schwarzer & Leppin, 1991). Prior research shows that social support can protect mental health in stressful situations by improving well-being, shifting negative perceptions, and promoting positive change (Li et al., 2021; Wills & Shinar, 2000). Therefore, social support is the key resource consistently associated with positive mental health outcomes. The social, economic, and psychological effects of the pandemic may impact different age groups in distinct ways, as younger and older adults differ in their attitudes, behaviors, and perceptions toward mental health (Robb et al., 2003). Reflecting on how different age groups perceive and experience the pandemic period, it is fundamental to explore how age groups experience the changes in modes of communication and how it influences their mental health, which can help formulate and tailor coping strategies and programs to cope with mental health. Given that the intersection of communication modes, age, and mental health—mainly when age is used as a comparative analytical lens—has not been thoroughly theorized in the existing literature, this study, employing a longitudinal panel analysis, aims to examine whether modes of communication influence younger and middle-aged adults' mental health and particularly, how social support can moderate this relationship across the pandemic periods. It is vital to address the psychological impacts, particularly during the pandemic, by implementing effective coping strategies and programs for better management.

## Changes in the Modes of Communication in Covid-19

Face-to-face communication is vital to relational and social development, affecting interpersonal relationships (Berger & Calabrese, 1974). It involves spoken and physical interactions (Fujihira et al., 2024), referring to the frequency of contact and how often they meet with family members, relatives, friends, or people working with them (Hu & Qian, 2021). Individual networks are formed through a range of interactions that exist within everyday life, and the interactions within these networks (Hill & Dunbar, 2003). Social connections are essential in individuals' social interactions, family structures and relationships, neighborhood environments, and social support systems. Reflecting upon the changes in the ways and methods of communication, there have been changes regarding how individuals connect with their interpersonal networks.

On the other hand, computer-mediated communication comprises social interactions via a computer. While the original conceptualization of computer-mediated communication involves the exchange of text-based messages over services such as e-mail or instant messenger, these services now offer much more complex computer-mediated communication using a combination of multimedia that includes words, photographs, audio, videos, and animations (Fox & McEwan, 2017). The modes of mediated communication involve indirect and written forms of interaction (Fujihira et al., 2024), referring to how often the respondents interacted with family members, relatives, friends, or colleagues via telephone and e-mail, respectively (Hu & Qian, 2021). Social distancing measures led to an increase in remote work and the use of virtual communication modes (A. Chen et al., 2023), indicating a shift in the structure and dynamics of social interactions with family members, friends, and acquaintances.

## Modes of Communication and Mental Health

Face-to-face communication and mediated communication, the modes of communication, can influence one's mental health or well-being. With Covid-19, social restrictions that limited face-to-face interactions have increased depressive symptoms (Alzueta et al., 2021; Sommerlad et al., 2022; Teo et al., 2019). The increase in face-to-face interactions reduced depression levels and enhanced individuals' well-being (Becker et al., 2019) by increasing perceived social support (J.-H. Kim, 2017). Studies revealed that mediated communication reduce depression (Arpino et al., 2021; Bessi ere et al., 2010), leading to an increase in well-being (Hajek & K onig, 2022). On the other hand, P. S. Lee et al. (2011) showed that social interactions via mediated communication negatively influenced people's perceived quality of life, suggesting that research tends to reveal different results when discussing the effects of mediated communication on mental health and well-being.

In discussing the effects of Covid-19 on different age groups, several studies employed age as a control variable. A study revealed that social distancing was associated with worse mental health among older people after controlling for age (Di Gessa & Price, 2022), while another study showed that over 60% of participants reported negative physical, emotional, and social impacts on their well-being, with Covid stressors affecting young adults (Kidd et al., 2021). Social isolation during the Covid-19 pandemic negatively affected mental health and well-being (Sep ulveda-Loyola et al., 2020). Another stream of prior research employed specific age groups, for instance, examining the impact of Covid-19 on younger adults' mental well-being, revealing that emotional support via face-to-face interactions led to lower levels of depression (Longest & Kang, 2022), while a study explored the associations between social contact, social

support, and depressive symptoms for older adults during the pandemic (Ang, 2022). Some explored age-based differences in mental health, revealing that younger age groups were more vulnerable, reporting greater stress, anxiety, and depression compared to middle and older age groups (Varma et al., 2021). A study examined how the association between social activity engagement and loneliness varies among younger, middle-aged, and older adults. Notably, younger adults experienced higher levels of emotional loneliness than middle-aged adults and older adults (Teater et al., 2021). While prior research generally employed age as a control variable, focused on specific age groups, or explored age-based differences when discussing the impacts of social isolation, loneliness, and mental health in the context of Covid-19, this research expands the scope of research by exploring younger and middle-aged adults' communication effects and mental health.

The pandemic's social, economic, and psychological impacts may affect various age groups differently (Varma et al., 2021). Users in specific developmental periods, in the lifetime stages (Benson & Elder, 2011; Lachman et al., 2015), would likely react to the pandemic differently as they may be more vulnerable to positive or negative consequences from using communication modes on their mental health. In lifespan development, age-differences occur in life tasks, social beliefs and values, cognitive capacities, and psychological well-being (Blanchard-Fields & Chen, 1996; Y. Chen & Persson, 2002). This study explores the effect of communication modes on mental health of younger adults (20–39) and middle-aged adults (50–64). The age classifications are informed by empirical distinctions observed in prior studies concerning media use, policy support, and mental health crises (Chu, 2010; Kang et al., 2024; Wester et al., 2023). Age groups differ in socio-developmental trajectories that shape their employment patterns, social engagement, and psychological needs

(Ballard & Morris, 2003; Manivannan et al., 2021; Spiteri et al., 2019). As the pandemic progresses through different phases, identifying age-specific effects of communication modes on mental health is increasingly important for developing targeted policies and strategies that support the well-being of each group. Accordingly, the study explores how communication environments interact with age-specific contexts, offering a more nuanced understanding of the relationship between communication modes and mental well-being. Based on aforementioned discussions, we can hypothesize that modes of communication can significantly predict mental health outcomes, namely, anxiety and depressive symptoms over time. Thus, we propose the following research hypothesis.

H1. Modes of communication will significantly predict mental health outcomes over time.

## Social Support Theory

Meaningful social interactions are fundamental to human well-being (Baumeister & Leary, 1995). Social support theory is the most influential theoretical perspective on social support, and it hypothesizes that support reduces the effects of stressful life events on health (Lakey & Cohen, 2000). Social support evaluates “the psychological and material resources available from an individual's interpersonal relationships” (Rodriguez & Cohen, 1998), which includes instrumental and emotional assistance and sources of support from family and friends that enhance self-esteem and alleviate distress (Dumont & Provost, 1999). It relates to how individuals seek companionship, assistance, and emotional support from family and friends and the availability of such support when needed (Gjesfjeld et al., 2008). From the perspective of mental health research, studies have explored the relationships between social support and various physical or psychological outcomes (Morelli et al., 2015).

Social support can protect individuals from negative consequences, promoting positive life changes by improving emotional well-being and health outcomes (A. N. Cohen et al., 2004; Dukes Holland & Holahan, 2003; Sherbourne, 1988).

In the context of the pandemic, a growing body of research has emphasized the protective role of social support in mitigating adverse mental health outcomes. Social support functions not only as a direct positive influence on mental health but also as a moderating factor in various stress-related contexts. First, several studies have demonstrated that social support directly buffers the effects of social isolation and loneliness on mental health. For example, low levels of social support and increased loneliness were significant predictors of depression (Cacioppo et al., 2010; Santini et al., 2015). Second, regarding economic and environmental stressors, research has identified social support as a key moderator; for instance, Viseu et al. (2018) found that social support weakens the relationship between economic stress and symptoms of anxiety and depression. These findings align with how personal resources, such as social support, weaken the adverse effects of financial stress on mental health (Fernandez et al., 2015; Jesus et al., 2016). Third, research has also explored the moderating role of social support in the context of psychological traits and coping strategies. Social support moderated the relationship between intolerance of uncertainty and mental health outcomes (Zhuo et al., 2021). Xu et al. (2020) showed that social support moderated the relationship between loneliness and anxiety, and the relationship between resilience and subjective well-being (Khan & Husain, 2010). Finally, age-specific analyses have revealed that the effects of social support can vary by demographic context. A study confirmed that social support plays a protective role against the negative impacts of interpersonal conflicts experienced during the pandemic on mental health (Jeon & Kim, 2021), while Li et al. (2021) further extended this finding by showing that

moderate to high levels of social support protected mental health during the pandemic. The studies outline the role of social support in protecting mental health during crises, which is relevant to developing interventions and support. Based on the above discussions, we can hypothesize about the moderating role of social support on the relationship between modes of communication and mental health over time. Based on above discussions, we propose the following hypothesis.

H1a (moderation). The relationship between modes of communication and mental health will be moderated by levels of social support, such that higher social support weakens the negative impact of certain communication modes.

The study contributes to existing literature in several ways. First, this study advances scholarship on communication and mental health during public health crises by investigating the effects of face-to-face and mediated communication on anxiety and depression across age groups during and after the pandemic. Second, the study highlights the need for age-specific policy interventions that enhance emotional support through mediated communication—such as digital support programs for younger adults and digital literacy and engagement strategies for middle-aged adults—to strengthen the benefits of social support. Finally, this study demonstrates that the effects of communication on mental health are shaped not merely by the frequency of such interactions but by contextual, relational, and temporal factors.

## METHOD

### Sample

This study employed longitudinal panel data collected at three-time points: the spread of

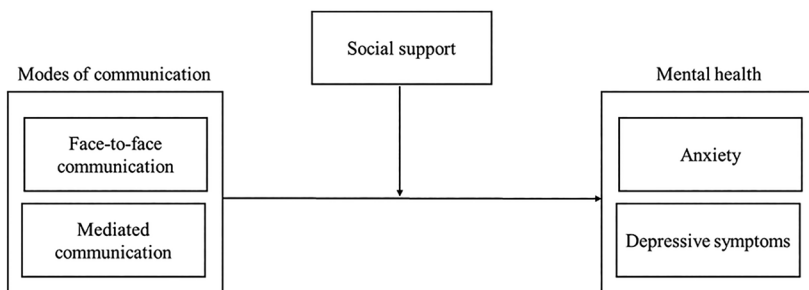
the Omicron variant (T1), the release of social distancing measures (T2), and the normalization phase (T3). Although there was a two-year gap between T1 (November 2021) and T2 (April 2023) and a one-year gap between T2 and T3 (April 2024), each time point reflects critical shifts in Korea's public health and social policy responses to the pandemic. T1 corresponds to the widespread Omicron outbreak and strict social distancing (Level 4), T2 captures the complete lifting of distancing policies, and T3 represents a period of stabilized normalization. These turning points reflect meaningful psychological and behavioral transitions rather than intermediate intervals. The fixed effects model accounts for time-invariant characteristics, and dummy coding of T2 and T3 relative to T1 enables comparison of phase-specific effects, minimizing concerns of uneven temporal spacing.

We explored the effect of communication modes (face-to-face and mediated communication) on mental health (anxiety and depressive symptoms) for younger and middle-aged adults. We analyzed whether social support moderates such associations. The Hausman test was conducted to select the fixed or random effects models for the panel regression analysis. Figure 1 presents the study's research model.

Following approval from Seoul National University and Korea Advanced institute of Science and Technology (KAIST)'s Institutional

Review Board (IRB), the survey was administered online through a specialized survey agency with three time periods: Time 1 (November 18, 2021 – November 29, 2021), Time 2 (April 21, 2023 – May 4, 2023), and Time 3 (April 9, 2024 – April 17, 2024). Time points (T1, T2, T3) were treated as dummy variables where T1 indicated the reference group (T1 = reference group). T2 and T3 were coded as binary indicators (1 = presence of condition at that wave, 0 = otherwise) to capture phase-specific effects. Following prior policy and demographic research (Hamler et al., 2022; H. Jung et al., 2023; Hwang, 2020; KOSIS, 2024), we categorized participants into two distinct age groups: younger adults (ages 20–39) and middle-aged adults (ages 50–64). This classification is consistent with existing studies that define individuals in their 20s and 30s as young adults, given their shared patterns in education, employment, and digital engagement. In contrast, those in their 50s and early 60s are commonly referred to as middle-aged or pre-retirement population within public health and welfare literature (Ballard & Morris, 2003; Spiteri et al., 2019; Wester et al., 2023). The analysis excluded participants aged 40–49 who exhibit transitional characteristics in communication behavior and mental health, showing hybrid traits that blur the distinctions between younger and middle-aged groups (S. H. Lee & Han, 2019; Spiteri et al., 2019), potentially

**Figure 1.** *Research Model*



compromising analytical clarity. Based on this classification, we conducted descriptive statistics of the participants' demographics using SPSS 23.0 (Table 1) and obtained 1,351 valid responses for younger adults and 2,173 for middle-aged adults. Among the younger adults, 56.9% were male ( $n = 769$ ) and 43.1% were female ( $n = 582$ ); for the middle-aged group, 61.2% were male ( $n = 1,329$ ) and 38.8% were female ( $n = 844$ ). Regarding educational attainment, most younger adults (87.5%,  $n = 1,184$ ) and middle-aged adults (68.1%,  $n = 1,481$ ) held a university degree. The most common monthly income bracket was KRW 3–5 million, reported by 28.9% of younger adults ( $n = 418$ ) and 29.3% of middle-aged adults ( $n = 637$ ). Following the sample description, we examined attrition and missing data. At T1, 5,889 participants responded; 2,280 remained at T2 and 1,835 completed T3, indicating a 61.3% dropout after baseline and an additional 7.6% loss between T2 and T3. Thus, 1,835 participants (31.1%) provided complete panel data, while the rest contributed partially. Missing data were handled with Full Information Maximum

Likelihood (FIML), which retains incomplete cases and reduces bias. Results were consistent with listwise deletion, suggesting minimal impact of missingness. Table 2 shows the descriptive statistics by age group and time point.

## Measures

### *Face-to-face and Mediated Communication*

All measurement instruments were drawn from validated scales from prior Korean or cross-cultural studies. This study adapted face-to-face and mediated communication measures from scales originally developed in Korean by Kim et al. (2022) and Kwon (2020). Face-to-face communication measured on average, how often participants met in person to talk with the following people over the past month with four items: people you live with ( $M = 6.36$ ,  $SD = 1.61$ ), family or relatives (excluding those you live with) ( $M = 3.48$ ,  $SD = 1.82$ ), acquaintances, friends, and colleagues for work or study purposes ( $M = 4.58$ ,  $SD = 2.25$ ), and acquaintances, friends, and colleagues for personal purposes ( $M = 3.72$ ,  $SD =$

**Table 1.** Demographic Information of Young Adults and Middle-Aged Adults

Variables		Younger adults	Middle-aged adults
		$n$ (%)	$n$ (%)
Gender	Male	769 (56.9)	1329 (61.2)
	Female	582 (43.1)	844 (38.8)
Educational level	Less than high school graduation	79 ( 5.9)	345 (15.9)
	University graduation	1184 (87.5)	1481 (68.1)
	Graduate school or higher	88 ( 6.6)	346 (15.9)
Average monthly income	Less than 100 KRW	45 ( 3.3)	52 ( 2.4)
	100 ~ 300 KRW	376 (27.8)	364 (16.8)
	300 ~ 500 KRW	418 (28.9)	637 (29.3)
	500 ~ 700 KRW	271 (20.0)	480 (22.1)
	700 ~ 900 KRW	148 (11.0)	356 (16.4)
	More than 900 KRW	93 ( 6.9)	284 (13.0)
Total		1,351 (100)	2,173 (100)

**Table 2.** Descriptive Statistics ( $M \pm SD$ ) by Age Group and Time Point

Variable	Group	T1	T2	T3	Kurt T1	Kurt T2	Kurt T3	Skew T1	Skew T2	Skew T3
Face-to-Face Com.	Younger	4.91 (1.36)	5.21 (1.38)	4.78 (1.44)	2.77 (.133)	3.10 (.133)	2.59 (.133)	-0.19 (.067)	-0.09 (.067)	-0.12 (.067)
	Middle	4.28 (1.16)	4.50 (1.13)	4.41 (1.25)	3.09 (.105)	3.01 (.105)	2.88 (.105)	.42 (.053)	.03 (.053)	-.04 (.053)
Mediated Com.	Younger	4.85 (1.56)	5.11 (1.46)	4.90 (1.50)	3.25 (.133)	2.84 (.133)	2.85 (.133)	-.37 (.067)	-.08 (.067)	-.12 (.067)
	Middle	4.49 (1.35)	4.66 (1.24)	4.46 (1.29)	2.91 (.105)	2.9 (.105)	2.85 (.105)	-.23 (.053)	-.24 (.053)	-.17 (.053)
Social Support	Younger	5.18 (1.35)	5.22 (1.34)	4.97 (1.40)	3.07 (.133)	2.94 (.133)	3.08 (.133)	-.50 (.067)	-.55 (.067)	-.44 (.067)
	Middle	5.06 (1.21)	5.02 (1.20)	4.97 (1.29)	2.97 (.105)	3.01 (.105)	3.1 (.105)	-.37 (.053)	-.48 (.053)	-.50 (.053)
Depressive Symptoms	Younger	3.29 (1.43)	3.12 (1.47)	3.33 (1.48)	2.58 (.133)	2.58 (.133)	2.43 (.133)	.33 (.067)	.43 (.067)	.32 (.067)
	Middle	3.23 (1.27)	3.16 (1.37)	3.10 (1.35)	2.83 (.105)	2.54 (.105)	2.53 (.105)	.34 (.053)	.35 (.053)	.34 (.053)
Anxiety	Younger	3.20 (1.51)	3.16 (1.58)	3.34 (1.57)	2.35 (.133)	2.5 (.133)	2.47 (.133)	.30 (.067)	.45 (.067)	.39 (.067)
	Middle	2.92 (1.29)	2.94 (1.44)	2.92 (1.40)	2.98 (.105)	2.82 (.105)	2.38 (.105)	.56 (.053)	.64 (.053)	.48 (.053)

Note: Values are presented as means (standard deviations). Skewness and kurtosis are presented with standard errors in brackets.

1.84) (Cronbach's  $\alpha = .586$ ).

Mediated communication measured on average, how often participants communicated remotely (via voice or video calls, text messages, KakaoTalk, etc.) with the following people over the past month with four items: people you live with ( $M = 5.48$ ,  $SD = 1.96$ ), family or relatives (excluding those you live with) ( $M = 4.17$ ,  $SD = 1.76$ ), acquaintances, friends, and colleagues for work or study purposes ( $M = 4.51$ ,  $SD = 2.08$ ), and acquaintances, friends, and colleagues for personal purposes ( $M = 4.44$ ,  $SD = 1.91$ ). Both face-to-face and mediated communication items were measured using a 9-point Likert scale (1 = never, 9 = several times an hour), and we measured the average of the total scores for each variable (Cronbach's  $\alpha = .696$ ).

### Social Support

Social support was measured with four items based on prior research (Gjesfeld et al., 2008), referring to the question: people sometimes look to others for companionship, assistance, or other types of support. How often is each of the following kinds of support available to you if you need it? The items included someone to help with daily chores if you were sick ( $M = 4.89$ ,  $SD = 1.59$ ), someone to love and make you feel wanted ( $M = 5.06$ ,  $SD = 1.42$ ), someone to do something enjoyable with ( $M = 5.05$ ,  $SD = 1.38$ ), and someone to turn to for suggestions about how to deal with a personal problem ( $M = 4.92$ ,  $SD = 1.43$ ). Each item was measured on a 7-point Likert scale (1 = never, 7 = always), and we calculated the average score across the items (Cronbach's  $\alpha = .909$ ).

### *Anxiety and Depressive Symptoms*

Anxiety and depressive symptoms were measured using two items each from the General Health Questionnaire-12 (GHQ-12), as adapted by (Park et al., 2012), which has been psychometrically validated in Korean samples. Anxiety was assessed with two items: "I cannot sleep well due to worries" ( $M = 2.97, SD = 1.52$ ) and "I always feel tense" ( $M = 3.40, SD = 1.49$ ), was  $r = .73$  ( $p < .001$ ). Depressive symptoms were measured using "I feel unable to overcome problems" ( $M = 3.07, SD = 1.51$ ) and "I feel unhappy or depressed" ( $M = 3.07, SD = 1.59$ ), was  $r = .81$  ( $p < .001$ ). Each item was rated on a 7-point Likert scale (1 = strongly disagree, 7 = strongly agree), and average scores were calculated for each construct. All items were originally constructed in Korean or translated using standardized back-translation procedures through a professional survey agency.

### **Analysis**

Interaction terms were created between the time dummies and the communication variables to examine the time-specific effects of communication on mental health outcomes. Time was coded as three dummy variables representing T1, T2, and T3, corresponding to the Omicron phase, the end of social distancing, and the normalization phase, respectively. Face-to-face communication and mediated communication variables were mean-centered prior to constructing interaction terms to minimize multicollinearity. For example, the interaction term "FTF  $\times$  T2" was created by multiplying the mean-centered face-to-face communication variable by the T2 dummy variable. The same approach was applied for "FTF  $\times$  T3", "mediated  $\times$  T2", and "mediated  $\times$  T3". Social support was measured at all three time points and included as a time-varying covariate in the fixed effects model. The interaction terms involving social support (e.g., FTF  $\times$  social support  $\times$  T2) were

constructed similarly, using mean-centered variables and time dummies.

### **RESULTS**

The study verified the influence of face-to-face and mediated communication on the mental health of younger and middle-aged adults over the Covid-19 pandemic. The Hausman test was conducted to select the random or fixed effects models for the panel regression analysis. The Hausman test was conducted to determine whether the random or fixed effects models were more suitable for the panel regression analysis. The test results indicated that the p-value was statistically significant ( $p < .001$ ), suggesting a correlation between the explanatory variables and latent individual effects. Consequently, the fixed-effects specification was suitable for the regression analysis (Hausman, 1978). This approach enables a more accurate estimation of the effects of face-to-face and mediated communication by controlling individuals' time-invariant characteristics.

### **Younger Adults – Communication Modes and Mental Health, and the Moderating Role of Social Support**

For younger adults, H1 predicted that modes of communication will significantly predict anxiety and depressive symptoms over time (Table 3). Results revealed that face-to-face communication ( $\beta = .523, t = 1.89, p > .05$ ) and mediated communication ( $\beta = -.458, t = -1.89, p > .05$ ) did not significantly influence anxiety over time. Similarly, mediated communication did not have statistically significant effects on depressive symptoms ( $\beta = -.378, t = -1.54, p > .05$ ). Only face-to-face communication significantly influenced depressive symptoms ( $\beta = .791, t = 2.82, p < .05$ ), implying that an increase in face-to-face communication was associated with an increase in depression levels. The results indicate

**Table 3.** *Younger Adults' Modes of Communication and Mental Health*

	Model 1. Anxiety			Model 2. Depressive symptoms		
	Coeff.	S.E	<i>t</i> ( <i>p</i> )	Coeff.	S.E	<i>t</i> ( <i>p</i> )
(constant)	4.343	1.277	3.40 (.000)	3.398	1.292	2.26 (.000)
FTF	.523	.277	1.89 (.060)	.791	.280	2.82 (.005)
SS	-.291	.053	-5.46 (.000)	-.274	.097	-2.81 (.005)
FTF×SS	-.103	.053	-1.92 (.055)	-.156	.054	-2.88 (.004)
T1	-.252	1.694	-.15 (.882)	.944	1.714	.55 (.592)
T2	1.816	1.710	1.06 (.288)	1.822	1.729	1.05 (.292)
T3	.043	1.496	.03 (.977)	3.751	1.513	2.48 (.013)
FTF×T1	.039	.436	.09 (.929)	.058	.443	.14 (.889)
FTF×T2	-1.103	.415	-2.66 (.008)	-1.034	.419	-2.46 (.014)
FTF×T3	-.261	.343	-.60 (.552)	-.970	.387	-2.51 (.012)
T1×SS	.118	.343	.35 (.729)	-.312	.347	-.90 (.369)
T2×SS	-.333	.346	-.96 (.338)	-.378	.351	1.08 (.287)
T3×SS	.045	.306	.15 (.884)	-.747	.389	-2.51 (.017)
FTF×SS×T1	-.021	.081	-.26 (.797)	.007	.083	.09 (.930)
FTF×SS×T2	.193	.078	2.47 (.014)	.165	.079	2.08 (.037)
FTF×SS×T3	.030	.073	.04 (.691)	.172	.074	2.41 (.010)
Mediated	-.458	.242	-1.89 (.059)	-.378	.244	-1.54 (.123)
Mediated×SS	.102	.046	2.18 (.030)	.064	.047	1.35 (.176)
Mediated×T1	.279	.372	.75 (.453)	-.047	.376	-.27 (.785)
Mediated×T2	.818	.388	2.11 (.035)	.789	.392	2.01 (.045)
Mediated×T3	.397	.351	1.13 (.258)	.266	.356	.75 (.455)
Mediated×SS×T1	-.049	.073	-.70 (.487)	.019	.072	.27 (.789)
Mediated×SS×T2	-.145	.077	1.97 (.049)	-.115	.074	-1.5 (.133)
Mediated×SS×T3	-.065	.068	-.95 (.342)	-.034	.068	-.49 (.621)
F	17.87 (.000)			12.24 (.000)		
R <sup>2</sup>	.134			.214		

Note: FTF: Face-to-face communication; SS: Social support

that face-to-face communication does not significantly alleviate anxiety, nor does mediated communication directly reduce depressive symptoms among younger adults. The time variables (T1, T2, T3) were not significant in most models, but T3 had a significant effect on depressive symptoms ( $\beta = 3.751, t = 2.48, p < .05$ ). This suggests that the effects of communication

modes on mental health do not adjust significantly over time. Additionally, regarding the interaction between face-to-face communication and time periods, the interaction of face-to-face communication and T2 significantly and negatively influenced anxiety ( $\beta = -1.103, t = -2.66, p < .01$ ) and depressive symptoms ( $\beta = -1.034, t = -2.46, p < .05$ ), and the interaction of

face-to-face communication and T3 significantly and negatively influenced depressive symptoms ( $\beta = -.970, t = -2.51, p < .05$ ). Regarding the interaction between mediated communication and time periods, for mediated communication, the interaction of mediated communication and T2 significantly and negatively influenced anxiety ( $\beta = .818, t = 2.11, p < .05$ ) and depression levels ( $\beta = .789, t = 2.01, p < .05$ ), and no other time periods.

H1a predicted that the relationship between modes of communication and mental health will be moderated by levels of social support among middle-aged adults. First, the interaction of T1 and social support did not significantly influence anxiety ( $\beta = .118, t = .35, p > .05$ ), nor in T2 ( $\beta = -.333, t = -.96, p > .05$ ), and T3 ( $\beta = .045, t = .15, p > .05$ ). Only the interaction of T3 and social support had a significant influence on depressive symptoms ( $\beta = -.747, t = -2.41, p < .05$ ), and not in T1 ( $\beta = -.312, t = .90, p > .05$ ) and T2 ( $\beta = -.378, t = 1.08, p > .05$ ). Regarding the moderating role of social support, the interaction of face-to-face communication and social support at T1 did not have a significant influence on anxiety ( $\beta = -.021, t = -.26, p > .05$ ) nor depression ( $\beta = .007, t = .09, p > .05$ ). However, the interaction of face-to-face communication and social support at T2 significantly and positively influenced anxiety ( $\beta = .193, t = 2.47, p < .05$ ) and depression ( $\beta = .165, t = 2.08, p < .05$ ), while the interaction of face-to-face communication and social support at T3 significantly and positively influenced depressive symptoms ( $\beta = .172, t = 2.32, p < .05$ ). The interaction of mediated communication and social support at T1 did not have a significant influence on anxiety ( $\beta = -.049, t = -.70, p > .05$ ), nor at T3 ( $\beta = -.065, t = -.95, p > .05$ ), but the interaction of face-to-face communication and social support at T2 negatively influenced anxiety ( $\beta = -.145, t = -1.97, p < .05$ ). The interaction of mediated communication and social support at T1 ( $\beta = .019, t = .27, p > .05$ ), T2 ( $\beta = .115, t = -1.50, p > .05$ ), and T3 ( $\beta = -.034, t = -.49, p > .05$ ) did not

have a significant influence in reducing anxiety. In the mode of mediated communication, social support had a direct effect on anxiety ( $\beta = -.291, t = -5.46, p < .001$ ) and depression ( $\beta = -.145, t = -1.97, p < .001$ ).

### **Middle-aged Adults – Communication Modes and Mental Health, and the Moderating Role of Social Support**

For middle-aged adults, H1 predicted that modes of communication will significantly predict anxiety and depressive symptoms over time (Table 4). Mediated communication significantly influenced anxiety ( $\beta = -.452, t = -3.45, p < .001$ ) and depressive symptoms ( $\beta = -.138, t = 2.21, p < .05$ ), decreasing anxiety and depression levels for middle-aged adults. Regarding the interaction between mediated communication and time periods, the interaction of mediated communication and most time periods did not have a significant effect on mental health. Only the interaction of mediated communication and T2 had a significant influence on anxiety ( $\beta = .793, t = 2.51, p < .05$ ). The results show that face-to-face communication can provide emotional support and a sense of stability, but the effects did not vary significantly across different time periods (early, mid, and post-pandemic periods). Additionally, the interaction between mediated communication and time periods were largely insignificant in influencing anxiety and depression levels, suggesting that the effect of mediated communication on mental health for middle-aged adults may be limited. For middle-aged adults, the time periods (T1, T2, T3) were not statistically significant in the association of mental health.

H1a predicted that the relationship between modes of communication and mental health will be moderated by levels of social support among middle-aged adults. The interaction of the time periods (T1, T2, T3) and social support did not significantly influence anxiety nor depressive symptoms. The interaction of face-to-face

**Table 4.** Middle-Aged Adults' Modes of Communication and Mental Health

	Model 1. Anxiety			Model 2. Depressive symptoms		
	Coeff.	S.E	<i>t</i> ( <i>p</i> )	Coeff.	S.E	<i>t</i> ( <i>p</i> )
(constant)	5.506	.955	5.76 (.000)	4.941	.902	5.48 (.000)
FTF	.116	.232	.50 (.618)	.024	.219	.11 (.912)
SS	-.213	.050	-4.23 (.000)	-.319	.291	-3.52 (.001)
FTF×SS	-.165	.058	-2.86 (.004)	-.191	.054	-3.54 (.000)
T1	-1.646	1.407	-1.17 (.242)	.116	1.328	.09 (.930)
T2	-1.384	1.296	-1.07 (.286)	.440	1.224	.36 (.719)
T3	-.389	1.194	-.33 (.745)	1.005	1.127	.89 (.373)
FTF×T1	-.015	.344	-.05 (.963)	.037	.325	.11 (.900)
FTF×T2	-.496	.357	-1.39 (.165)	-.389	.337	-1.15 (.251)
FTF×T3	.122	.327	.37 (.708)	-.047	.308	-.15 (.880)
T1×SS	.335	.276	1.21 (.225)	-.052	.261	-.30 (.762)
T2×SS	.206	.257	.80 (.423)	.095	.249	.50 (.623)
T3×SS	-.002	.241	-.10 (.929)	-.258	.228	-1.13 (.259)
FTF×SS×T1	-.001	.065	-1.15 (.128)	-.003	.062	-.05 (.961)
FTF×SS×T2	.096	.068	1.40 (.162)	.078	.065	1.20 (.229)
FTF×SS×T3	-.111	.063	-.17 (.861)	.024	.060	.39 (.694)
Mediated	-.452	.298	-3.45 (.000)	-.138	.064	2.21 (.038)
Mediated×SS	.049	.039	1.23 (.219)	.005	.037	1.20 (.232)
Mediated×T1	.421	.300	1.40 (.163)	.004	.284	-.01 (.989)
Mediated×T2	.793	.316	2.51 (.012)	.374	.298	1.25 (.211)
Mediated×T3	-.014	.312	-.03 (.973)	-.084	.291	-.29 (.774)
Mediated×SS×T1	-.136	.058	-1.99 (.047)	-.146	.069	-2.01 (.047)
Mediated×SS×T2	-.138	.061	-2.26 (.024)	-.039	.058	-.58 (.561)
Mediated×SS×T3	.008	.067	.12 (.894)	.013	.057	.23 (.816)
F	10.29 (.000)			24.77 (.000)		
R <sup>2</sup>	.189			.227		

Note: FTF: Face-to-face communication; SS: Social support

communication and social support at T1 did not have a significant influence on anxiety ( $\beta = -.001$ ,  $t = -1.15$ ,  $p > .05$ ), nor depressive symptoms ( $\beta = -.003$ ,  $t = -.05$ ,  $p > .05$ ). The interaction of face-to-face communication and social support at T2 did not have a significant influence on anxiety ( $\beta = .096$ ,  $t = 1.40$ ,  $p > .05$ ), nor depressive symptoms ( $\beta = .078$ ,  $t = 1.20$ ,  $p > .05$ ). Likewise,

the interaction of face-to-face communication and social support at T3 did not have a significant influence on anxiety ( $\beta = -.111$ ,  $t = -.17$ ,  $p > .05$ ), nor depressive symptoms ( $\beta = .024$ ,  $t = .39$ ,  $p > .05$ ). The interaction of mediated communication and social support at T1 negatively influenced anxiety ( $\beta = -.146$ ,  $t = -2.01$ ,  $p < .05$ ) and negatively influenced anxiety in T2 ( $\beta = -.138$ ,  $t =$

-2.26,  $p < .05$ ). However, the interaction between mediated communication did not significantly influence depressive symptoms at T2 ( $\beta = -.039$ ,  $t = -.58$ ,  $p > .05$ ) and T3 ( $\beta = .013$ ,  $t = .23$ ,  $p > .05$ ).

## DISCUSSION

This study examined the effects of face-to-face and mediated communication on mental health (anxiety and depressive symptoms) among younger and middle-aged adults, with a focus on the moderating role of social support. The study analyzed whether the effects of social support vary based on modes of communication, face-to-face communication and mediated communication across the time and age groups. The summary of the research findings is as follows.

The findings indicate that for younger adults, the effects of face-to-face and mediated communication on mental health vary across periods, particularly during T2 and T3. During T2, face-to-face communication significantly reduced anxiety and depressive symptoms, suggesting that the increase in face-to-face interactions during the release of social distancing measures may have amplified positive psychological effects. During T3, in the normalization period, face-to-face communication reduced depressive symptoms, although the effect was somewhat diminished compared to T2. These results underscore the positive impact of face-to-face communication, suggesting that frequency of contact contributes to securing and maintaining a sense of psychological stability (Sommerlad et al., 2022). It implies the transitional nature of T2, the lifting of social distancing measures, and individuals engaged in face-to-face interactions after prolonged restrictions. During this phase, individuals may have experienced psychological and emotional burdens, facing changes in social expectations and norms. These contextual factors explain the significant effects observed predominantly at T2, marking a critical phase in

the pandemic in the context of communication and mental health.

However, when examining the interaction effects, some counterintuitive findings emerged. Specifically, during T2, face-to-face communication—while generally showing a protective effect against depression—was associated with a paradoxical increase in depressive symptoms when combined with high levels of social support. This pattern may reflect the transitional nature of T2 when individuals re-engaged in social relationships following the release of social distancing measures. High-frequency interactions with socially supportive others may have resulted in perceived pressure and emotional tension, thereby increasing a sense of psychological burden. This interpretation aligns with prior literature suggesting that the qualitative context of social interaction—not merely its frequency—can significantly influence well-being (Fingerman et al., 2021; S. Cohen & Wills, 1985). On the other hand, the interaction of mediated communication and T2 significantly increased both anxiety and depression during T2, suggesting that mediated communication may have acted as a stressor, potentially exacerbating feelings of social isolation or failing to provide sufficient emotional support for younger adults. Overall, regarding the effect of modes of communication on mental health, face-to-face communication played a critical role in alleviating anxiety and depressive symptoms during T2 and T3, with its impact being more pronounced during T2.

Regarding the protective role of social support, social support moderated the association between mediated communication and anxiety among younger adults, particularly during T2. When accompanied by social support, mediated communication appeared to mitigate anxiety by substituting physical proximity. The findings align with functional equivalence theory, which suggests that mediated communication can compensate for maintaining social connection when face-to-face interaction is limited

(Horstmann et al., 2021). In the association between modes of communication and mental health, social support played a moderating role in the association between face-to-face communication and mental health during T2. Yet, as noted above, this moderation effect revealed counterintuitive outcomes, implying the context-dependent nature of social support and the need for further exploration into how emotional expectations and interpersonal stressors interact over the pandemic. During prolonged crises such as a pandemic, heightened social expectations or obligations within close relationships may unintentionally intensify levels of stress, particularly when communication is limited. This is consistent with previous research indicating that social support can, under certain circumstances, have ambivalent effects—especially when it is perceived as mismatched, intrusive, or when it amplifies social pressure (Maisel & Gable, 2009). These findings give insights into how the quality, type, and source of support and individuals' emotional needs influence the efficacy of social support during the periods of social disruption.

For middle-aged adults, mediated communication during T2 was significantly associated with increased anxiety, suggesting that simply that mediated communication, at the time of the release of social distancing measures, may have triggered concerns of infection or relational pressures. This finding aligns with Skalacka and Pajestka (2021), who noted that older adults often use mediated communication primarily as a functional tool for information exchange rather than as a source of emotional fulfillment. Particularly during transitional periods with heightened uncertainty levels, such interactions may instead amplify psychological stressors. However, our findings reveal that when individuals receive social support, it reduced the anxiety-inducing effects of mediated communication. In other words, social support played a moderating role, buffering the impact

of mediated communication on anxiety during T2. The findings suggest that remote social interactions, with genuine emotional connection, can be a protective mechanism against anxiety for middle-aged adults (Berg-Weger & Morley, 2020). In a socially restricted environment with limited physical contact, mediated support may have provided an emotionally meaningful substitute for face-to-face interaction. In contrast, there was no significant moderating effect of social support in the association between face-to-face communication and mental health among middle-aged adults across any time point. This lack of significance may reflect the limited availability and quality of in-person interactions during the pandemic. Birditt et al. (2021) emphasized that the extent to which communication is emotionally fulfilling for older adults depends upon intimacy and perceived support. Middle-aged adults may have restricted access to meaningful social interactions or struggled to gain emotional benefits from face-to-face interactions rooted in routine or obligation.

Moreover, several associations in the model were not statistically significant, yet we interpret these findings as theoretically meaningful. For example, the absence of benefits from social support suggests that its effects are context-dependent, particularly when emotional expectations are misaligned, or the social environment is unstable (Thoits, 2011). The efficacy of support depends on factors that comprise the period, communication modes, and emotional congruence. These findings challenge the assumption that social support promotes mental health and highlight the importance of the dynamics of situational factors in designing social and psychological interventions. By interpreting both significant and non-significant results, this study advances a more nuanced understanding of how communication modes and social support interact to influence mental health. The findings reinforce that the effects of communication are not determined merely by quantity or presence

but by contextual, relational, and temporal dynamics that shape it.

### Theoretical and Practical Implications

The study holds several theoretical implications. First, the study examined the effects of face-to-face and mediated communication on the mental health of younger and middle-aged adults, analyzing the different periods of the pandemic. Unlike prior research that primarily focused on examining the effects of communication modes at specific points in time (Berger & Calabrese, 1974; Ellison et al., 2014), this study, employing a longitudinal panel study, explored the changes regarding the influence of communication modes on mental health over time. The study expands the scope of research on communication and mental health, particularly analyzing the effects of face-to-face and mediated communication on two key dimensions of mental health: anxiety and depressive symptoms of young and middle-aged adults over the pandemic and the post-pandemic period.

Second, the results reveal that the effect of modes of communication on mental health varies for younger and middle-aged adults at the periods. For younger adults, face-to-face communication decreased anxiety and depressive symptoms, while mediated communication during T2 increased anxiety levels. These findings align with prior studies that showed that individuals engaging in face-to-face communication were less likely to experience depressive symptoms, reducing such negative impact (J.-H. Kim, 2017; Litwin & Levinsky, 2022; Sommerlad et al., 2022; Teo et al., 2019). The results imply that face-to-face interactions are crucial in offering individuals the psychological resources essential for maintaining health (Holt-Lunstad et al., 2010; S. Cohen & Wills, 1985). Face-to-face interactions bring positive emotions, including joy, enthusiasm, and vitality (McIntyre et al., 1991), alleviating levels of depression (Seligman et al., 2006). On the other hand, mediated

communication at T2 was related to higher levels of anxiety. For younger adults who invest resources in building, managing, and forming social relationships (Cornwell et al., 2008; Gillath et al., 2011), face-to-face interactions are the primary modes for interpersonal relationships (Baym et al., 2004). However, mediated communication tools may be insufficient in replicating face-to-face interactions (Holtzman et al., 2017), even leading to fatigue, exhaustion, and stress (Bailenson, 2021; Queiroz et al., 2023). In uncertain times, mediated communication may serve primarily as the channel for routine work or academic tasks, lacking emotional support provided by face-to-face interactions. For middle-aged adults, only mediated communication increased anxiety levels during T2, and for other times, modes of communication did not have a significant influence on anxiety or depressive symptoms. This effect could be more pronounced among middle-aged adults with limited access to digital technology and digital skills. Prior research showed that frequent usage of digital forms of communication to maintain social contact is associated with negative effects on mental health among older adults (Skalacka & Pajestka, 2021). Mediated communication itself may diminish the perceived quality of life by lacking nonverbal cues and reducing engagement, hindering the development of emotional support (P. S. Lee et al., 2011). At other times, middle-aged adults' mental health was not affected by the frequency of face-to-face or mediated communication. The findings suggest that the quality of communication, the context of interactions, or other significant factors such as economic stability or one's health status may significantly influence middle-aged adults' mental health.

Third, for younger adults, in the association between mediated communication and anxiety, social support played a moderating role in reducing anxiety levels during T2. This finding aligns with the functional equivalence theory, which posits that mediated communication can

compensate for maintaining social connection when face-to-face interaction is limited (Horstmann et al., 2021). Digital communication reduced feelings of loneliness and enhanced perceptions of social support, alleviating the psychological impact of the pandemic (Gabbadini et al., 2020). The findings indicate that social support may moderate the effect of stressful life events on health and mental health, moderating the relationship between life changes, stress, and negative outcomes (Cobb, 1976; S. Cohen, 2004; Wang et al., 2014). For middle-aged adults, in the association between mediated communication and anxiety in T2, social support played a moderating role in reducing anxiety levels. Social support can enhance the quality of mediated interactions and mitigate anxiety in the period of uncertainty, especially in the time of the release of social distancing measures. While mediated communication itself, the frequency of digital contact alone may not be enough to mitigate anxiety, social support can moderate the association between mediated communication and anxiety for middle-aged adults. This implies that social support via mediated communication is a protective source of mental health, creating a sense of social connectedness (Ellison et al., 2014) and positively influencing and strengthening social support. Mental health depends on the type of social support, indicating that social support works as a valid moderator of mental health at specific times of the pandemic. Notably, there was no moderating effect of social support in the association between communication modes and mental health for middle-aged adults across most periods, excluding T2.

The research findings have practical implications, such as mental health support policies and strategies for younger and middle-aged adults following the pandemic. For younger adults, face-to-face communication remains an essential source of emotional support and is key to maintaining social support networks (Gaggero et al., 2022; Hu & Qian, 2021). Increasing face-to-

face interactions mitigate anxiety and depressive symptoms following the period after the release of the social distancing measures. Further, social support via mediated communication can protect younger adults' mental health. The results highlight the importance of social support as a resource that can moderate the association between mediated communication and mental health consequences. Our findings suggest that having strong social connections and support (Baumeister & Leary, 1995) through digital communication outlets is the key psychological resource that protects individuals from negative consequences. Therefore, from a policy perspective, it is necessary to enhance emotional support and management programs via mediated tools to address the stress and tension that may arise during the post-pandemic period (Prime et al., 2020). Mediated communication tools can provide avenues for younger adults to have access to tailored programs and interventions that enhance social support, which is necessary to mitigate stress, anxiety, and depression levels.

Middle-aged adults at specific developmental stages may be susceptible to communication methods' positive or negative impacts, with their social relationships evolving (Fiori et al., 2006). For middle-aged adults, online social connections can effectively enhance social support, mitigating health anxiety and isolation during Covid-19 (Stuart et al., 2021). Mediated communication serves as a means of gaining social support that mitigates the negative consequences of mental health. Enhancing social support through mediated communication plays a vital role in improving anxiety levels during the period of the release of social distancing measures. For middle-aged adults, rather than simply engaging in mediated communication during the post-pandemic period, it would be necessary to strengthen the ways and forms of social support through mediated communication. Policy initiatives, incentives, and education programs to enhance middle-aged adults' digital skills

will be necessary to increase their resilience and adaptability when faced with unexpected pandemic situations (Sin et al., 2021). This highlights the necessity for strengthening digital skills, capabilities, and the quality of digital communication (Ellison et al., 2014; Kovacs et al., 2021) and improving social support systems via mediated communication avenues. Policy support and effective interventions should help middle-aged adults overcome such barriers and negative consequences with digital communication strategies and digital literacy programs that can amplify the positive impact of social support on mental health.

### Limitations and Future Research

This study distinguishes itself by longitudinally analyzing the effects of face-to-face and mediated communication on mental health among young and middle-aged adults. We employed a panel regression approach, which controls for unobserved time-invariant individual factors and provides consistent estimates of within-individual changes. Compared to multilevel modeling or latent growth curve modeling, panel regression is simpler to implement and does not require specifying growth trajectories. However, unlike latent growth models, it does not capture individual differences in change over time. Future studies could adopt alternative longitudinal methods to explore variability in communication and mental health trajectories. The overall impact of communication modes on mental health yielded many non-significant results. Still, rather than dismissing these findings, they highlight the importance of examining the boundary conditions of theoretical assumptions (Thoits, 2011). For instance, the fact that social support did not consistently reduce depression across all time points suggests that its effects may be context-dependent, shaped by situational demands, communication quality, or emotional congruence (S. Cohen & Wills, 1985; Thoits,

2011). Therefore, future research should focus on analyzing the qualitative dimensions of communication (e.g., reciprocity, emotional tone) and the contextual variables involved (e.g., pandemic-related uncertainty, social stressors) (Varma et al., 2021).

The study analyzed panel data from South Korea, where the trajectory of the COVID-19 pandemic may differ across countries with varying population density, cultural norms, social structure, and public health policies (Anderson et al., 2020). Thus, cross-national comparisons could provide further insights into how cultural and structural differences shape the effects of communication and support on mental health. Future research could compare the influence of communication modes and the role of social support across regions and cultural contexts. This study employed an exploratory approach to examine the effects of communication on mental health within a naturalistic social context rather than experimental control. Self-reported measures, while potentially subjective (Olson, 1981), are commonly used to assess psychosocial experiences and remain valid tools in communication and mental health research (Tarrant & Cordell, 1997). To reduce bias, this study employed validated survey items. Nevertheless, future research may combine self-reports with behavioral or physiological data, such as digital communication logs or biometric stress indicators, to triangulate findings and increase measurement precision.

One limitation lies in the use of the two-item measures to assess anxiety and depressive symptoms. Although the measures were employed from the validated General Health Questionnaire-12 (Park et al., 2012) and demonstrated acceptable internal consistency, these may not fully reflect the multidimensional nature of these constructs. Prior literature notes that brief measures may overlook cognitive, behavioral, or physiological symptoms (Beuke et al., 2003; Kalin, 2020). While using concise

instruments is justified in large-scale panel designs to reduce fatigue (Hinkle et al., 2012; Vink et al., 2008), future studies could incorporate more comprehensive tools such as the GAD-7 or CES-D to enhance construct validity.

Another limitation concerns the limited internal consistency of the face-to-face communication construct. This may reflect the scale's intentional design to include varied interpersonal contexts—such as interactions with family, friends, and coworkers—rather than measuring a single, uniform construct. While such heterogeneity may reduce internal coherence, it enhances ecological validity by capturing the complexity of real-world communication experiences (Kim et al., 2022). The items were retained for conceptual relevance and grounding in prior validated instruments. However, future research should consider refining the measure—possibly by distinguishing subdimensions based on the types of relationships to enhance reliability while maintaining conceptual depth.

Lastly, while the proposed moderation model offers a useful theoretical framework, it would be necessary to extend upon employing alternative moderation or mediation models. For example, it is plausible that communication modes influence mental health via perceived emotional closeness or communication satisfaction (Burlison, 2003; Hawkey & Cacioppo, 2010). Future research should examine these psychological mechanisms in greater depth while also exploring how the post-pandemic transformation of communication norms continues to influence well-being—particularly in the context of economic strain, health concerns, and evolving social structures (Berger & Calabrese, 1974; Vindegaard & Benros, 2020). Further, media and digital literacy, in particular, may play a critical moderating role in how individuals engage with the modes of communication (Bosanac & Luic, 2021), which may moderate the psychological effects of mediated communication. Without acknowledging these variations, analyses may

overlook key factors that shape differential outcomes across different ages. Future research should consider individuals' literacy levels as potential moderating variables that may influence the association between communication modes and mental health.

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