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Original Research

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The Role of Sociability in Mental Health in Mid to Late Life During COVID-19

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Abstract

Some adults in mid and late life may have been particularly sensitive to the negative effects of social disruptions due to COVID-19 restrictions. The current study explored whether sociability moderated links between disrupted contact with friends and family and multiple indicators of mental health. We collected quantitative data via an online survey from a community sample of 136 adults in mid to late life (*M* age = 67.77, range 50–91; 69.3% females; 92.7% White). We conducted a series of hierarchical linear regressions to test for moderation. Controlling for age, gender, and marital status, sociability moderated the associations between disruptions in social interactions and depressive symptoms, but not anxiety or life satisfaction. Namely, disruptions to social interactions were positively associated with depressive symptoms only for sociable individuals. Given the potential for future social disruptions, our findings point to the importance of considering the role of sociability in developing interventions that target adults.

Keywords: *sociability, extraversion, COVID-19 pandemic, social disruptions, mental health, older adults*

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Introduction

In the spring of 2020, physical distancing restrictions were implemented to reduce the spread of COVID-19, especially among at-risk individuals, such as older adults. Unfortunately, the loss of social connections resulting from these restrictions had unintended adverse consequences, particularly for the older adults the policies were intended to protect (Kim & Jung, 2021; Tyrrell & Williams, 2020). However, research conducted during COVID-19 lockdowns across various countries pointed to certain behavioral factors that protected older adults against the negative mental health outcomes of these social restrictions (e.g., physical exercise, use of video technologies; Carriedo et al., 2020; Strutt et al., 2022). Notably, even certain personality traits (e.g., conscientiousness) were found to be associated with lower levels of depression among adults during COVID-19 (Nudelman et al., 2021), indicating the potential for enduring individual characteristics to have acted as protective factors.

Sociability, a component of extraversion characterized by a preference for high levels of social affiliation, presents an interesting paradox in trying to understand the role of personality in the COVID-19 context. On the one hand, sociability should protect against negative mental health outcomes induced by the pandemic, given its documented benefits for mental health (e.g., reduced loneliness, greater life satisfaction, and positive affect; Emmons & Diener, 1986; Marini et al., 2023; Wilt et al., 2012). On the other hand, the unique circumstances of the pandemic (i.e., the physical distancing necessary to reduce the spread of the disease) could have made a higher level of sociability a liability (Rolón et al., 2021; Wijngaards et al., 2020). In fact, our earlier work indicated that sociability exacerbated the negative association between COVID-19-related social disruptions and life satisfaction within a sample of emerging adults (Khan & Fiori, 2022). Building upon this work, the purpose of the present study was to examine whether sociability similarly moderated the association between COVID-19-related social disruptions and mental health outcomes within a community sample of mid- and late-life American adults. Given that social support and engagement are particularly important in mid and later life, as adults experience age-related physical and cognitive declines (Antonucci et al., 2014; Delgado et al., 2023; Holt-Lunstad et al., 2010; Huxhold et al., 2022), further investigation into the role of sociability in the relationship between social disruption and mental health in this older population is warranted.

Theoretical Framework

To understand the dynamic interplay among individuals, their social networks, and the contexts in which they are embedded, we use the Differential Investment of Resources (DIRe) Model as our theoretical framework (Huxhold et al., 2022). According to this model, individuals must invest resources in the form of time and energy to establish and maintain social relationships. Individuals' capacities (e.g., health) influence how much time and energy they can invest; their motivations (e.g., personality) influence how much of that time and energy they invest and to whom it is directed; and their skills (i.e., social skills) influence the efficacy of their investments. At the same time, the context can shape these individual characteristics, and, more importantly, define the individuals' social opportunity structure (Bloem et al., 2008; Thomése et al., 2003). That is, the context greatly influences the availability of social ties, as well as the costs of investing in those ties.

In the present study, sociability can be understood as an individual characteristic (motivation) that plays a role in determining adults' investments in their social networks. Sociability, a component of the higher-order trait of extraversion (which includes other features, such as dominance, spontaneity/impulsivity, talkativeness, and boldness; Emmons & Diener, 1986; Wilt et al., 2012), is a preference for high levels of social affiliation (Derekshan & Eysenck, 1998; Plomin, 1976; Pollet et al., 2011; Watson & Clark, 1997). We focus on sociability in the present study, rather than on extraversion more broadly or its other components, because the idea we are proposing (i.e., that more extraverted individuals suffered more during the pandemic due to social restrictions) is most relevant to this facet of extraversion (Kroencke et al., 2023). Per the DIRe model,

adults who are highly sociable would be motivated to invest greater time and energy into their relationships. However, as Hagberg and colleagues (2002) noted, sociability "requires the possibility of being with others and quality of life is experienced as worse when this possibility is limited" (p. 184).

Although other technologies, such as video chat, enabled continued connection with others during the pandemic, scholars found that these required considerable energy, which problematized "the claim that modalities closely approximating [face-to-face] communication can help individuals get their social needs met" (Hall et al., 2021, p. 12). In fact, in a large sample of Europeans aged 50 and older, Litwin and Levinsky (2023) found that, although face-to-face contact significantly reduced negative mental health changes, electronic contact actually increased them. Thus, in the first years of the pandemic—the basis of the current study—restrictions put in place to curb the spread of COVID-19 formed a context that directly constrained individuals' social opportunity structure, reducing the availability of ties while simultaneously increasing the costs of maintaining ties (Rolón et al., 2021).

Costs of Social Disruptions Due to the COVID-19 Pandemic and the Role of Sociability

Across the lifespan, both support from close others (Antonucci et al., 2014) and interactions with wider social networks of friends and acquaintances (Fiori et al., 2006) are crucial for mental health and well-being (Berkman et al., 2000). As noted above, such support and engagement may be particularly important in mid and later life, as adults experience age-related physical and cognitive declines (Antonucci et al., 2014). In fact, social engagement is considered a key factor in promoting well-being later in life (Holt-Lunstad et al., 2010; Huxhold et al., 2022), which may explain why the physical distancing required during the COVID-19 pandemic was particularly disruptive for older adults. Beginning in April 2020, individuals around the world experienced large decreases in the number of face-to-face social activities with family and friends, and these decreases were associated with lower well-being (e.g., life satisfaction; Ammar et al., 2020). Among older adults in particular, loneliness (Heidinger & Richter, 2020), as well as anxiety and depression (Sepúlveda-Loyola et al., 2020), increased during the pandemic, at least in part due to required physical distancing (Kim & Jung, 2021; Krendl & Perry, 2021).

Interestingly, the nature of pre-pandemic social networks seemed to have created a trade-off to some extent, in terms of mental and physical health for older adults (Coleman et al., 2022). Specifically, Coleman and colleagues found that older adults with tightly knit, highly integrated pre-pandemic networks tended to take fewer COVID precautions, in part due to less exposure to novel information highlighting the threats of COVID-19. Although this put their physical health at risk, it appeared to result in better mental health. In contrast, older adults with broader, more diverse pre-pandemic networks took greater COVID-19 precautions (protecting themselves from disease), but suffered more negative mental health outcomes. Although this work nicely demonstrates the complexity of the links between different characteristics of social networks and individuals' well-being, it did not examine disruptions individuals may have experienced within their social networks (i.e., loss of friends, separation from loved ones). Such an inquiry is important, as there is evidence that some older adults may have been particularly sensitive to the negative effects of social disruptions based on their individual characteristics (e.g., personality; Nudelman et al., 2021).

Research conducted during the pandemic showed that, although some personality factors (e.g., grit) were associated with greater resiliency among individuals (Bono et al., 2020), other personality traits typically associated with positive mental health benefits, such as extraversion (Emmons & Diener, 1986; Wilt et al., 2012), were not (Anglim & Horwood, 2021; Wijngaards et al., 2020). Extraversion may even have posed a risk, in terms of disease contraction (Rolón et al., 2021), depressive symptoms (Alt & Walper, 2021; Sommerlad et al., 2021), and loneliness (Alt & Walper, 2021). Introverts actually seemed to have benefited from stringent COVID-19 protection measures (Wijngaards et al., 2020), whereas individuals who were more sociable pre-pandemic (i.e., had more social contact) were more adversely affected by the loss of social

connection than were less socially active people (Sommerlad et al., 2021). A more recent multi-study paper, however, did not find any evidence that extraverted individuals suffered more than introverts from changes in social interaction patterns during the COVID-19 pandemic (Kroencke et al., 2023). Importantly, though, the samples used in this, and the majority of other papers cited above, included a wide age range of adults aged 18 and older and did not test for age differences.

Developmental changes in both personality and social relationships in adulthood highlight the limitations of such broad samples. First, longitudinal research has documented changes that occur in personality across adulthood (Small et al., 2003), with extraversion, for example, declining later in life (Roberts et al., 2006). Second, social relationships shift as adults age. Consistent with the DIRe Model (Huxhold et al., 2022), declines in age-related health reduce adults' capacities for investing in social ties in mid and later life. Changing social motivations (i.e., greater prioritization of close ties) (Carstensen, 2021) and increasing social skills (e.g., reappraisal of interpersonal tensions) (Birditt et al., 2020) can compensate for these losses to some extent, but they make maintaining a broad, diverse network challenging. Moreover, older adults experience changes in contexts (e.g., retirement) that limit their social opportunity structure, reducing the availability of ties and increasing the costs of investing in those ties. COVID-19 pandemic restrictions likely exacerbated such limitations, underscoring the importance of examining these associations within a sample of mid- and later-life adults more specifically.

Purpose of the Study

The purpose of the current study was to build on earlier work. The previous study highlighted the role of sociability in amplifying the negative links between COVID-19-related social disruptions and life satisfaction among emerging adults (Khan & Fiori, 2022). The present study examined a community sample of mid- and late-life adults to explore whether sociability moderated the links between (a) different types of social disruptions due to COVID-19 restrictions (difficulties with interactions vs. actual losses/separations) and (b) multiple indicators of mental health (depressive symptoms, anxiety symptoms, and life satisfaction). We predicted the following:

Hypothesis 1: Sociability would be negatively associated with depressive symptoms and anxiety, but positively associated with life satisfaction.

Hypothesis 2: COVID-related social disruptions would be positively associated with depressive symptoms and anxiety, but negatively associated with life satisfaction.

Hypothesis 3: COVID-related social disruptions would interact with sociability in predicting all three mental health outcomes. More specifically, we predicted that the associations between COVID-related social disruptions and mental health would be stronger among individuals who were more sociable.

Method

Recruitment and Participants

The current study used a community sample of mid- and late-life adults recruited locally (from a medium-sized, private university in the Northeast United States, as well as from local senior community centers) and more widely via snowball sampling, the university website, social media platforms, etc. To be eligible, participants had to be at least 50 years old. Only one member of a household was eligible to participate. Data for this part of a larger, longitudinal study were collected via an online survey between June 2021 and September 2021. Each participant received a $10 Amazon gift card as compensation for completing the survey at each wave. The study was approved by the Institutional Review Board where the study was conducted.

The sample consisted of 136 adults between the ages of 50 and 91 (*M* age = 67.77; *SD* = 10.38), of whom 95 were female (69.3%). In terms of race/ethnicity, the majority of participants were White (92.7%; *N* = 127); 1.5% were Latino/a or Hispanic, 1.5% were Black or African-American, and 2.2% were Asian. Participants had pre-tax household annual incomes of at least $60,000 (80.3%); 60.6% were retired, and 33.6% were employed full-time or part-time. Most participants (70.1%) were married or living with a partner, with 12.4% being divorced or separated, 9.5% widowed, 5.1% never married, and 2.2% casually or exclusively dating.

Measures

Social Disruptions Due to COVID-19 Restrictions

To assess social disruptions due to COVID-19 restrictions, we first used a set of modified questions from the RAND American Life Panel and Questionnaire for assessing the impact of the COVID-19 pandemic and accompanying mitigation efforts on older adults (Carman & Nataraj, 2020). Participants reported how difficult it was for them to interact with their social network members during the height of the COVID-19 pandemic. Specifically, participants were asked two questions: At the height of the COVID-19 pandemic, how difficult was it for you to: (1) Interact with your friends? and (2) Interact with your family? Each item was assessed on a scale from 1 (not at all difficult) to 5 (extremely difficult). Because of a very high correlation between these two items (r = .67, p < .01), they were combined into a mean scale (Cronbach's alpha = 0.80) capturing difficulties with social interactions.

Second, participants were presented with a list of 8 potentially desirable and 8 potentially undesirable experiences, adapted from Elder and Clipp's (1989) scale measuring Desirable and Undesirable Effects of Military Service. We used the following prompt: "Life experiences often have some mixture of the desirable and undesirable. From the following list of experiences, please indicate to what extent you experienced each one as a result of the COVID-19 pandemic, using the following response codes." Response codes ranged from 1 (not at all) to 4 (a lot), along with an option for not applicable. From the list of 16 experiences, we chose the two that captured undesirable social experiences: (1) loss of friends and (2) separation from loved ones. Due to a nonsignificant correlation between the two (r = .12, p = .16), these items were analyzed separately.

Sociability

Sociability was measured using a 10-item sociability scale from the International Personality Item Pool (IPIP) (IPIP Collaboratory; Goldberg et al., 2006). Each item was measured on a scale from 1 (very untrue) to 7 (very true) (e.g., "I make friends easily"). After reverse-coding the negatively-worded items (e.g., "I rarely enjoy being with people"), a mean scale was created (Cronbach's alpha = .90).

Depressive Symptoms

To measure depressive symptoms, we used an adapted short form of the Center for Epidemiologic Studies-Depression Scale (CES-D) (Radloff, 1977) consisting of 7 of the original 20 items. The items (e.g., "I felt depressed") were measured on a scale from 0 (rarely or none of the time—less than 1 day) to 3 (most or all the time—5–7 days). After reverse-coding the positively-worded items, all the items were summed to create a total depressive symptoms score ranging from 0 to 21 (Cronbach's alpha = .86). Due to non-normality in this variable (skewness = 1.66, *SE* = .21; kurtosis = 2.95, *SE* = .41), we used the square-root transformation for all inferential analyses.

Anxiety Symptoms

Anxiety symptoms were assessed with the short form of the Geriatric Anxiety Inventory (GAI-SF) (Byrne & Pachana, 2011). This scale consists of 5 items (e.g., "I worry a lot of the time"), with two response options: 1

(agree) or 0 (disagree). The items were summed for a total anxiety symptoms score ranging from 0 to 5 (Cronbach's alpha = .83). Due to non-normality in this variable (skewness = 1.12, *SE* = .21; kurtosis = -.08, *SE* = .41), we used the square-root transformation for all inferential analyses.

Life Satisfaction

Life satisfaction was assessed using the Satisfaction with Life Scale (Diener et al., 1985), which consists of 5 items (e.g., "In most ways my life is close to my ideal"), with response options ranging from 1 (strongly disagree) to 7 (strongly agree). The mean of the items was used for a total life satisfaction score ranging from 1 to 7 (Cronbach's alpha = .78). This variable was normally distributed.

Data Analysis

We conducted three hierarchical linear regressions predicting (1) depressive symptoms, (2) anxiety symptoms, and (3) life satisfaction, controlling for age, gender, and marital status in step 1; adding in the three social disruptions variables (difficulties with social interactions, loss of friends, and separation from loved ones) and sociability in step 2; and then adding the three interaction terms (e.g., difficulties x sociability) in step 3. All variables used to create the interaction terms were mean-centered, and any significant interactions were probed using simple slopes analysis. Due to the forced response requirements for all survey questions, we did not have any missing data.

Results

Descriptives

Table 1 provides descriptive statistics and correlations for all (non-transformed) study variables. Mean levels of both depressive and anxiety symptoms were relatively low, and levels of life satisfaction were relatively high. Sociability was negatively associated with loss of friends, depressive symptoms, and anxiety symptoms, whereas it was positively associated with life satisfaction and separation from loved ones. Interaction difficulties were moderately positively correlated with both loss of friends and separation from loved ones, as well as with depressive symptoms, and were negatively correlated with life satisfaction. Loss of friends was positively correlated with depressive symptoms and anxiety symptoms and negatively associated with life satisfaction. Regarding the control variables, females reported being significantly more sociable, anxious, and depressed than males, whereas age was negatively associated with anxiety symptoms. Finally, married participants reported significantly fewer depressive symptoms and greater life satisfaction than non-married participants.

Hierarchical Linear Regressions

To address the research question, three hierarchical linear regression models were conducted predicting (1) depressive symptoms, (2) anxiety symptoms, and (3) life satisfaction. As can be seen in Table 2, which shows the final step of each of these hierarchical regressions, sociability significantly negatively predicted depressive symptoms (β = -.27, p = .002), whereas interaction difficulties significantly positively predicted depressive symptoms (β = .19, p = .027). Furthermore, as predicted, sociability significantly moderated the association between interaction difficulties and depressive symptoms (β = .24, p = .008). Simple slopes analysis revealed that at low levels of sociability (1 *SD* below the mean), interaction difficulties were not associated with depressive symptoms (β = .04, p = .686) (see Figure 1). However, at high levels of sociability (1 *SD* above the mean), interaction difficulties were significantly positively associated with depressive symptoms (β = .42, p < .001). Of note, the interactions of sociability with both loss of friends and separation from loved ones were not significant.

Table 1: *Descriptive Statistics for and Correlations Among All Study Variables* (N = *136)*

	M (*SD*)/%	1	2	3	4	5	6	7	8	9	10
1. Female	69.3%	–									
2. Age	67.77 (10.38)	-.24**	–								
3. Married	70.1%	-.19*	-.10	–							
4. Sociability	5.19 (1.20)	.20*	-.11	.12	–						
5. Interaction difficulties	2.43 (1.11)	.05	-.02	-.07	.02	–					
6. Loss of friends	1.63 (0.94)	-.02	.08	-.05	-.19*	.28**	–				
7. Separation from loved ones	2.84 (1.05)	.16	.11	-.06	.23**	.33**	.12	–			
8. Depressive symptoms	3.85 (4.05)	.18*	-.16	-.19*	-.23**	.24**	.24**	.11	–		
9. Anxiety symptoms	1.31 (1.68)	.19*	-.31**	-.03	-.22*	.12	.18*	.06	.68**	–	
10. Life satisfaction	5.28 (1.21)	-.09	.08	.27**	.25**	-.26**	-.30**	.11	-.56**	-.51**	–

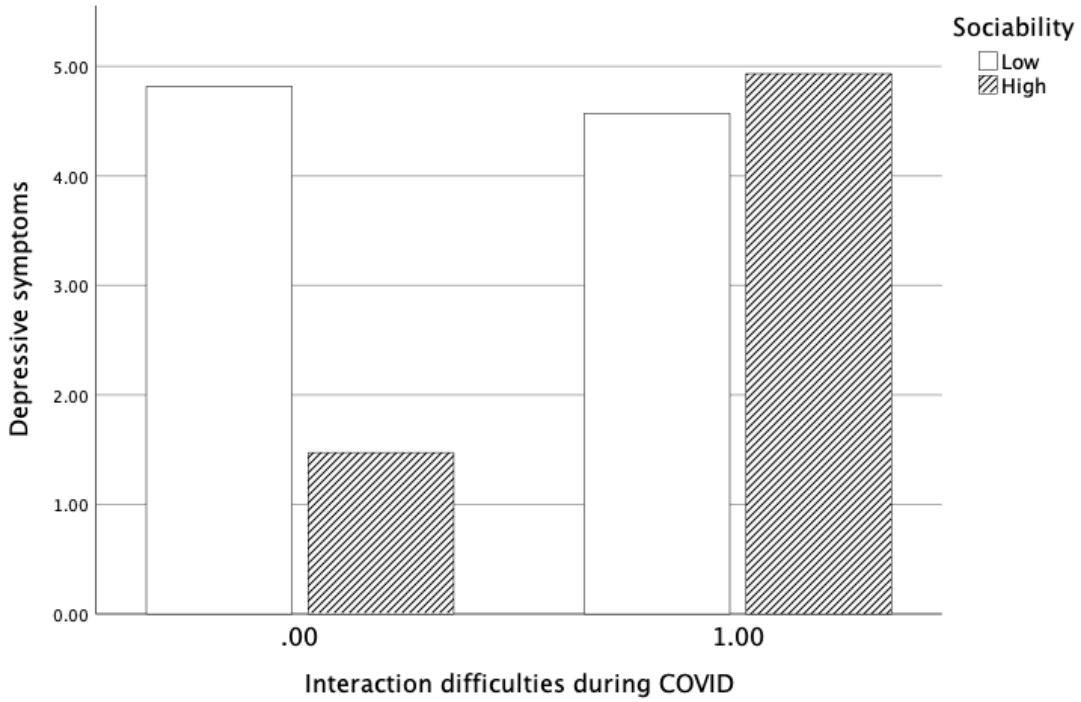
Note. *p < .05; **p < .01. Ranges: Sociability (1 to 7); Interaction difficulties (1 to 5); Loss of friends (1 to 4); Separation from loved ones (1 to 4); Depressive symptoms (0 to 21) (non-transformed); Anxiety symptoms (0 to 5) (non-transformed); Life satisfaction (1 to 7).

Table 2: *Hierarchical Linear Regression Models Predicting Depressive Symptoms, Anxiety Symptoms, and Life Satisfaction*

	Depressive symptoms[b]			Anxiety symptoms[b]			Life satisfaction		
Variables	B	*SE* B	β	B	*SE* B	β	B	*SE* B	β
Female	.22	.20	.10	.25	.16	.14	-.13	.22	-.05
Age	-.02	.01	-.16	-.03	.01	-.32**	.01	.01	.04
Married	-.37	.20	-.16	.03	.16	.02	.66	.21	.25**
Sociability	-.24	.08	-.27**	-.20	.06	-.28**	.18	.09	.18*
Interaction difficulties[a]	.18	.08	.19*	.07	.07	.10	-.27	.09	-.25**
Loss of friends[a]	.05	.10	.04	.08	.08	.09	-.26	.11	-.20*
Separation from loved ones[a]	.08	.09	.08	.08	.07	.10	.22	.10	.20*
Difficulties[a] x sociability[a]	.19	.07	.24**	.03	.06	.04	-.09	.08	-.11
Loss[a] x sociability[a]	-.15	.09	-.14	-.11	.07	-.13	.19	.10	.16
Separation[a] x sociability[a]	-.02	.07	-.02	.09	.06	.14	.04	.08	.05

Note. *p < .05; **p < .01. [a]Mean-centered. [b]Due to non-normality, depressive and anxiety symptoms have been transformed (square root).

Figure 1: *Sociability Moderates the Association Between Interaction Difficulties and Depressive Symptoms*



In the regression predicting anxiety symptoms, only age (β = -.32, p < .001) and sociability (β = -.28, p = .001) emerged as significant negative predictors. However, contrary to our hypothesis, sociability did not moderate the association between social disruptions due to COVID-19 restrictions and anxiety symptoms. In the regression predicting life satisfaction, both being married (β = .25, p = .003) and sociability (β = .18, p = .038) significantly positively predicted life satisfaction, whereas interaction difficulties (β = -.25, p = .003) and loss of friends (β = -.20, p = .017) significantly negatively predicted life satisfaction. Surprisingly, separation from loved ones was positively associated with life satisfaction (β = .20, p = .023). Similar to the findings for anxiety symptoms, sociability did not moderate the association between social disruptions due to COVID-19 restrictions and life satisfaction.

Discussion

Decades of research have established links between social integration and physical and mental health in adults (e.g., Berkman et al., 2000; Delgado et al., 2023; Holt-Lunstad et al., 2010; Huxhold et al., 2022). The COVID-19 pandemic made it challenging for mid- and late-life adults to maintain pre-pandemic levels of social integration, resulting in declines in well-being and increases in mental health problems (Kim & Jung, 2021; Krendl & Perry, 2021). Pandemic-era research indicated that some individuals may have been at greater risk than others for mental health problems (Nudelman et al., 2021), with the unique context of COVID-19 (i.e., physical distancing) potentially turning factors previously understood as protective, like sociability, into liabilities (Khan et al., 2022). Guided by the DIRe model (Huxhold et al., 2022), the purpose of the present study was to explore whether sociability increased the vulnerability of a community sample of mid- and late-life adults by exacerbating mental health problems associated with COVID-19-related social interaction difficulties. It is important to note that our sample was relatively well-resourced and primarily White, suggesting that we may be providing a conservative estimate of these links, as the pandemic had disproportionately negative

effects on individuals with fewer resources and on Black, Indigenous, and people of color (BIPOC) (Kanter et al., 2021; Tai et al., 2021).

Our findings within this sample underscored the complexity of this phenomenon, with associations depending on whether the social disruptions were experienced as difficulties with interactions or as actual losses/separations and the specific mental health outcome being examined. First, as hypothesized, sociability was significantly negatively associated with both depressive symptoms and anxiety symptoms and positively associated with life satisfaction. These findings are consistent with research showing the mental health benefits of sociability and extraversion (Soto, 2015) in terms of quality of life (Pocnet et al., 2017), anxiety symptoms (Hassan et al., 2021), and even mental health disorders (Kotov et al., 2010). Extraversion and sociability are thought to contribute to greater well-being in part through engendering access to a wider social network and, therefore, more social interactions and greater social support (Kroencke et al., 2023; Tan et al., 2017). Moreover, extroverts might derive greater enjoyment from these social interactions than their introverted counterparts (Kroencke et al., 2023). Alternatively, the mechanisms may relate to the enactment of more positive affect states (Wilt et al., 2012) and/or to higher self-esteem (Tan et al., 2017). In line with the DIRe Model (Huxhold et al., 2022), there is also likely a feedback loop in which the experience of positive affect creates resources (i.e., energy; Fredrickson, 2004) that can then be further invested into social ties.

Our second hypothesis regarding the link between COVID-related social disruptions and mental health was partially supported. Specifically, we found that retrospectively reported interaction difficulties during the height of the pandemic were positively associated with depressive symptoms and negatively associated with life satisfaction in the summer of 2021, and loss of friends was negatively associated with life satisfaction. Some research indicates that the well-being of older adults was particularly negatively impacted during the second wave of COVID-19 in late 2020 (Hansen et al., 2022), which may have been the time that the mid- and late-life adults surveyed were recalling. Thus, it is perhaps not surprising that reports of difficulties interacting with friends and family during the height of the pandemic were associated with increased depressive symptoms and decreased life satisfaction. Media reports about COVID-19 emphasized the vulnerability of older adults, such that younger individuals may have been particularly careful about avoiding physical contact with their older family members. This, combined with their own precautions, resulted in many older adults being cut off from their social ties (e.g., grandchildren). Although video technologies offered an avenue for remaining in contact with friends and family members (Brown & Greenfield, 2021), research suggests that relying exclusively on technology was associated with greater depression and anxiety (Lee et al., 2022). Among older adults in particular, only face-to-face visits during the COVID-19 pandemic were associated with less loneliness, depression, and anxiety (Dhakal et al., 2023; Litwin & Levinsky, 2022).

Interestingly, we found that social disruptions were unrelated to anxiety symptoms. This could be due in part to the fact that anxiety symptoms during the pandemic were driven more by health and financial concerns than by social concerns (Hoffart et al., 2021). Hoffart and colleagues, in their study of over 10,000 Norwegian adults during the COVID-19 pandemic, found that infection fears and financial worries were most closely linked to anxiety symptoms, whereas the components of loneliness (e.g., missing companionship, feeling left out, feeling isolated) were associated only with depression. Furthermore, whereas depression is typically linked to past events (i.e., past social disruptions), anxiety is more tied to future events (particularly uncertain ones; Eysenck et al., 2006). Thus, if we had inquired about anticipated disruptions instead of past ones, anxiety may have been more salient. Additionally, previous work suggests that extraversion—of which sociability is a component—is more strongly related to depressive symptoms, whereas anxiety symptoms are more closely associated with neuroticism (Jylhä & Isometsä, 2006).

Unexpectedly, and contrary to our hypotheses, we found that reports of separation from loved ones were positively associated with life satisfaction (although that separation was perceived to be an undesirable consequence of the pandemic). Perhaps relatedly, at the bivariate level, sociability was also positively correlated

with reporting separation from loved ones as an undesirable experience. Although these findings seem counterintuitive, it may be that more sociable individuals were more likely to recall and thus report experiencing separation from loved ones as "undesirable," such that the positive link between separation from loved ones and life satisfaction was driven in part by greater sociability. However, given that sociability was included as a predictor (and thus a covariate) in all of our analyses, this is unlikely to be the only explanation for this finding. Given the retrospective nature of the social disruption assessment, perhaps those who reported separation from loved ones as a particularly undesirable experience stemming from the pandemic are also those who were most happy to have at least some return to normality in their lives in the summer of 2021 after most people (particularly older adults) had been vaccinated. Finally, given that our closest ties are also sources of tension and tend to yield the most ambivalence (Fingerman et al., 2004), it is possible that separation from loved ones may have reduced exposure to negative or ambivalent social interactions. Birditt and colleagues (2021) found that older adults may have been more adversely affected by negative relationship quality during the pandemic compared to younger adults, suggesting that future research should consider how the quality of ties shapes the effects of their absence (i.e., during hospitalizations, potential future waves of the pandemic, relocations).

Finally, consistent with our third hypothesis, we found that sociability moderated the association between COVID-related social disruptions and mental health. More specifically, reporting greater difficulties with social interactions during the height of the pandemic was associated with increased depressive symptoms only for those higher on the scale of sociability. Seeking social support was a coping mechanism associated with resilience at the beginning of the pandemic among older adults (Fuller & Huseth-Zosel, 2021), and in fact social media communication was associated with increases in perceived control over social life among older adults high in extraversion at the beginning of the pandemic (Choi et al., 2023). However, the effectiveness of social support-seeking and social media use may have begun to wane throughout the course of the pandemic, weighing particularly heavily on sociable individuals who were perhaps more accustomed to and energized by face-to-face interactions. Introverts typically have fewer social interactions than extraverted individuals (Tan et al., 2017), such that the social restrictions of the pandemic may have had less of an impact on their behaviors and thereby less of a negative impact on their mental health (Wijngaards et al., 2020). Indeed, Liu and colleagues (2021) found that adults high in extraversion (particularly those with higher levels of sociability) experienced greater pandemic-related stress than those lower in extraversion. Consistent with our own reasoning in the present study, the authors posited that the primary source of stress for these extraverted individuals was likely the inability to socialize. In fact, Li et al. (2023) found that older adults' greater pre-pandemic social integration was associated with more missed social events, which led to more PTSD symptoms during the pandemic.

Interestingly, although we found that the loss of friends as an undesirable pandemic outcome was negatively associated with life satisfaction, this association was not moderated by sociability. This finding implies that even though difficulties interacting with friends and family during the pandemic were more challenging for sociable individuals, experiencing the actual loss of friends was uniformly detrimental. Recent research indicates that although the aging and well-being paradox (i.e., that subjective well-being tends to remain stable in late life in spite of objective losses) held true to some extent even during the pandemic (Fields et al., 2022), it does not appear robust to the loss of friends (Hansen & Blekesaune, 2022), implying that losing friends may be a uniquely challenging stressor for adults in mid and late life. Previous studies exploring the role of extraversion/sociability on adaptation to the pandemic have focused primarily on either emerging adults (e.g., Khan et al., 2022) and/or wide ranges of adults aged 18 and over (e.g., Wijngaards et al., 2020). The current study provides evidence that difficulties with social interactions stemming from pandemic-era restrictions may have been particularly difficult for individuals 50 and older.

Limitations and Directions for Future Research

It is important to acknowledge that the current study was not without its limitations. First, reports of social disruptions were retrospective, as participants were asked to consider their experiences during the height of

the pandemic, making it plausible that their current experiences of the pandemic may have shaped their responses. Moreover, participants may have been reporting on different times during the pandemic depending on where they were located, making it possible that there were varying durations between experienced symptoms and the experiences of the social disruptions. Additionally, although the loss of friends was presumed to be due to losing touch, it could also reference friends' passing due to COVID-19.

Second, as noted above, our sample was made up of primarily White adults with more resources (e.g., education, income), limiting the generalizability of our findings, as the pandemic disproportionately adversely affected individuals from lower socioeconomic strata and BIPOC (Kanter et al., 2021; Tai et al., 2021). Future research on the role of sociability during public health crises should include a more diverse sample to better understand whether this personality trait poses a uniform risk for poorer mental health, particularly as individuals who have greater resources may be better able to maintain social connections throughout a public health crisis (e.g., through access to consistent and reliable internet; Benda et al., 2020). Third, and relatedly, although snowball sampling is often used for more difficult-to-access populations (Sharma, 2017), this recruitment approach can violate the independent observation assumptions inherent to regression-based statistical techniques. To reduce this possibility, we prevented multiple members of the same household from completing the survey. It is still plausible that our participants self-selected into the study to some extent, with potentially higher levels of both sociability and mental health than the general population (as evidenced by relatively high means for sociability and life satisfaction and low means for anxiety and depression; see Table 1). Given that moderation was found, despite this reduced variability, it suggests that more heterogeneous samples would demonstrate even more robust connections. Future research should use random sampling to address this limitation. Additionally, the data collection approach—an online survey—may have favored older adults who were more comfortable with technology, who would also have been capable of maintaining social connections online more readily. It is important to note, however, that a broad range of older adults increased their technology use in response to the pandemic (Sixsmith et al., 2022), although the "gray digital divide" does persist (Sin et al., 2021).

Fourth, our sample included individuals between the ages of 50 and 91. This age range is broad and may not capture differences in social opportunity structures for those over the age of 65 (such as retirement) compared to those in mid-life (Huxhold et al., 2022). Finally, although this study revealed that sociability operated as a moderator of the links between pandemic-related social disruptions and mental health, future work should explore both the underlying mechanisms and whether other aspects of extraversion (e.g., dominance, spontaneity/impulsivity, talkativeness, and boldness; Emmons & Diener, 1986; Wilt et al., 2012) would also serve to moderate these links. For example, understanding why the loss of friends was universally pernicious for individuals' mental health, in comparison to the separation from loved ones (e.g., did "loss of friends" capture a loss more permanent than that of a temporary separation?) would provide invaluable information about what aspects of social ties are most critical for well-being and could provide potential points of entry for mental health interventions.

Conclusion

From a theoretical perspective (DIRe; Huxhold et al., 2022), our findings suggest that attending to the interplay between an individual's characteristics and the context in which they are embedded is essential for understanding the complexities of how the social network shapes mental health in mid and late life. That is when confronted with a context in which their social opportunity structures were constrained, even when those constraints were well-intentioned, highly sociable individuals seemed to have suffered more than those less motivated to invest time and energy into their social relationships. From a more practical perspective, these findings suggest that in the event of another widespread, serious health emergency, it will be critical to identify middle-aged and older adults who may be particularly at risk of experiencing adverse mental health outcomes due to constraints on their social engagement (e.g., highly sociable individuals) and to provide more

targeted interventions to support their mental health (Benke et al., 2023). It may also be prudent during any future health crises to popularize the phrase “distant socializing” rather than “social distancing” to emphasize the importance of maintaining social bonds while minimizing physical contact (Pandi-Perumal et al., 2021). Given that age-related societal norms such as retirement can reduce access to social opportunities in later life, and given that sociable individuals may be more vulnerable to the negative mental health consequences of these reductions (Hagberg et al., 2002), the role of sociability needs to be considered when developing interventions to enhance the social connectedness of individuals in mid and late life.

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