Can Resilience Buffer the Effects of Loneliness on Mental Distress Among Working-Age Adults in the United States During the COVID-19 Pandemic? A Latent Moderated Structural Modeling Analysis

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Abstract

Background The profound health consequences of loneliness are well-established. However, less is known about the protective factors which may alleviate the effects of loneliness on mental health especially among working-age adults amidst the COVID-19 pandemic. We draw on the social ecology of resilience and examine whether resilience factors can buffer the effects of loneliness on mental distress.

Methods Data came from the National Well-being Survey—a national study of a demographically representative sample of U.S. working-age adults ($N = 4014$). We used (a) structural equation models with latent variables to examine the main effects of loneliness, psychological resilience, and perceived social support on mental distress, and (b) latent moderated structural equations to estimate the latent interaction effects.

Results Results revealed that (a) loneliness was positively associated with mental distress and psychological resilience was negatively related to mental distress, and (b) psychological resilience and perceived social support moderated the strength of the relationship between loneliness and mental distress.

Conclusions Our study highlights the importance of psychological resilience and perceived social support as two protective factors in the relationship between loneliness and mental distress. Given that loneliness significantly predicts worse mental and physical health and higher mortality, identifying protective factors that might disrupt these connections is vital. As such, public health efforts to strengthen and expand familial and community social support networks and foster psychological resilience are urgently needed to support mental health among working-age adults during additional waves of the pandemic or future similar stressors.

Keywords Social support · Resilience · Mental health · Loneliness · Latent variable modeling · Latent moderated structural modeling

Introduction

Loneliness is an emotionally painful and distressing feeling resulting from a mismatch between the desired and achieved levels of social relationships with others [1, 2] and was recently declared as an "epidemic" in the United States (U.S.) [3–6] largely because of its high prevalence [7, 8] and profound health consequences [9]. The effects of loneliness on health are well-established and may be as detrimental as smoking 15 cigarettes per day [10]. Loneliness can increase health risks ranging from cardiovascular health to systolic blood pressure and incident coronary heart disease [11]. Loneliness is also associated with a range of adverse mental health outcomes such as depression and anxiety in both pre-pandemic [7, 12, 13] and pandemic studies [14]. A recent systematic review of 24 studies further substantiated that loneliness is associated with mental health symptoms among adults during the COVID-19 pandemic [14]. Mood disorders, such as depression and generalized anxiety, appear to be the most frequently examined outcomes [12].

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The COVID-19 pandemic represents a unique opportunity to examine the relationship between loneliness and mental health during a universal stressor considering the significant impacts it has had on loneliness and mental health due to social distancing restrictions [14]. Moreover, given the likelihood of future waves of COVID-19 and that both loneliness and depression impact physical health and mortality [15, 16], another important question concerns the protective factors which may alleviate the effects of loneliness on mental health, especially during such a global stressor. Identifying such protective factors can inform public health and mental health efforts during additional waves of the pandemic. Guided by the social ecology of resilience [17], we examine whether two resilience factors—psychological resilience and perceived social support—would moderate the relationship between loneliness and mental distress using a national sample of U.S. working-age adults (ages 18–64) that was collected in early 2021.

Loneliness and Mental Distress: the Role of Resilience Factors

Adults vary in their degree of susceptibility to the feeling of loneliness, and such susceptibility involves a wide array of interactions between social, psychological, and individual attributes [18–20]. *Resilience* is a potentially significant factor that can help explain why similar experiences of loneliness have different mental health implications for individuals. According to Windle [20, p12], *resilience* is "the process of effectively negotiating, adapting to, or managing significant sources of stress or trauma. Assets and resources within the individual, their life and environment facilitate this capacity for adaptation and 'bouncing back' in the face of adversity." To understand how *resilience* influences mental distress in the presence of loneliness, and in line with Windle's perspective, we draw on the social ecology of resilience [21] and conceptualize resilience as a multilevel construct. Specifically, we include both the positive individual attribute (i.e., psychological resilience) and external social resources (i.e., perceived social support) as potential protective factors that would buffer against the detrimental effect of loneliness on mental distress.

Psychological resilience is a learned capacity that builds developmentally over time and is generally considered as having the ability to "bounce back" from setbacks in life, or the ability to maintain a steady mental state despite acute setbacks or events [22–24]. Previous research suggests that psychological resilience is one of the most important personal attributes that is associated with mental health outcomes and can help explain variation in an individual's vulnerability to stress [24, 25]. Further, it is a key target for depression and anxiety treatment [26]. In general, less

resilient individuals are more vulnerable to adversities [27, 28]. Studies conducted during the COVID-19 pandemic also substantiated the main and buffering effect of psychological resilience. For example, less resilient American adults were more likely to experience increases in mental distress in the early months of the pandemic [29]. Using data collected during the acute COVID-19 outbreak in April 2020, Barzilay and colleagues found that psychological resilience moderated the relationships between COVID-19-related worries and anxiety and depression among healthcare and non-healthcare professionals [30]. Likewise, Traunmüller and colleagues found that psychological resilience buffered the psychological impact of COVID-19 on anxiety symptoms among a large sample of Austrian adults [31]. The existing literature has suggested that psychological resilience plays a protective or buffering role in the relationships between stressors and well-being outcomes [30, 31]. Hence, we expand on extant literature by taking the next step to examine the protective role of psychological resilience on the link between loneliness, a prevalent stressor, and mental distress among working-age adults.

Perceived social support refers to an individual's subjective appraisal of the availability of resources when needed as well as the quality of these resources [32]; it is a proven buffer to reducing stress, depression, and anxiety [33, 34]. The social ecology of resilience suggests that the social environment can have an equally—if not more—important role in shaping overall resilience compared to individual-level factors [21]. Research has empirically documented that perceived social support is not only an independent predictor of mental health problems such as depression in both pre-pandemic [35, 36] and pandemic studies [33, 34], but also a factor that moderates the association between stress and mental distress [37–40]. For example, adults with higher perceived social support reported significantly lower levels of depression compared to those with lower perceived social support during the COVID-19 pandemic [33]. In light of these findings and the fact that social support is a potentially modifiable factor [41, 42], it is important to empirically examine perceived social support as a protective factor in the link between loneliness and mental distress.

Drawing on data from a demographically representative sample of U.S. working-age adults, this study investigates the moderating effects of two modifiable resilience factors (i.e., psychological resilience and perceived social support) on the link between loneliness and mental distress. We hypothesized that (a) the main effects of loneliness, psychological resilience, and perceived social support on mental distress would be significant and (b) the relationship between loneliness and mental distress would be stronger when adults report lower psychological resilience (vs. higher psychological resilience) or lower perceived social support (vs. higher perceived social support).

Method

Data and Participants

Data were from the National Well-being Survey (NWS; redacted for the peer-reviewing process), a national cross-sectional survey of working-age adults of ages 18–64 in the United States. Data were collected in February and March of 2021 through an online survey. Recruitment of survey participants was done by Qualtrics Panels. To recruit participants, Qualtrics drew from a database of more than a million U.S. adults. Special attention was given to recruiting a sample that was demographically representative based on age and sex as well as race and ethnicity of the working-age population in the U.S. Participants were compensated. Compensation varied in amount and type based on the recruitment strategy used by Qualtrics (e.g., SkyMiles rewards, points to retail outlets, gift cards). The final sample contained 4014 working-age adults (ages 18–64). Post-stratification weights were created by Qualtrics to ensure that the sample approximates the distributions of age, sex, race and ethnicity, and education from the American Community Survey estimates from 2015 to 2019. We applied the sampling weights to all analyses. The NWS completion rate (40.4%) represents the total number of survey respondents ($N = 4014$) among those who clicked on the survey link and viewed the NWS survey invitation and informed consent page ($N = 11,580$). NWS data collection was approved by the Institutional Review Board at Syracuse University.

Measures

Mental Distress

In line with other research [29], mental distress was measured using the Patient Health Questionnaire-4 (PHQ-4), which is an ultra-brief screener for core symptoms of depression and anxiety [43]. It is a validated scale which includes two items of PHQ-2: "During the past two weeks, how often have you been bothered by: having little interest or pleasure in doing things; and feeling down, depressed, or hopeless," and two items of generalized anxiety disorder [44]: "During the past two weeks, how often have you been bothered by: feeling nervous, anxious, or on edge; and not being able to control worrying." Participants reported on a scale of 0 (*not at all*) to 3 (*nearly every day*). To account for measurement error, we included mental distress as a latent variable, composed of four manifest items mentioned earlier.

Loneliness

Loneliness was measured with the three-item UCLA Loneliness Scale Short-Form [45]. Respondents were asked three

questions: "How often do you feel left out?" "How often do you feel you lack companionship?" and "How often do you feel isolated from others?" on a scale of 1 (*never*) to 4 (*always*). The latent loneliness variable was based on the three manifest items.

Psychological Resilience

The six-item Brief Resilience Scale was used to assess psychological resilience [23]. Responses were on a 5-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). Items included three positively worded statements: "I tend to bounce back quickly after hard times," "It does not take me long to recover from a stressful event," and "I usually come through difficult times with little trouble," and three negatively worded statements "I have a hard time making it through stressful events," "It is hard for me to snap back when something bad happens," and "I tend to take a long time to get over setbacks in my life." The three negatively worded items were reverse coded. The latent psychological resilience variable was composed of these six items.

Perceived Social Support

We used three survey questions to capture perceived social support [46]. Two survey questions were about instrumental support: "Is there someone you could count on if you needed a loan for $200 (1 = *yes*, 0 = *no*)?" and "Is there someone you could count on if you needed a place to live (1 = *yes*, 0 = *no*)?" and another one about emotional support: "How much are friends or relatives willing to listen when you need to talk about your worries or problems (1 [*not at all*] to 4 [*a great deal*])?" The latent perceived social support variable was composed of these three items.

Covariates

Given that specific factors, such as gender, age, marital status, and physical health, are related to mental health symptoms [1, 47], participants' sociodemographic characteristics and health-related factors were included as covariates (see Tables 1 and 2 for detailed coding). These included age, sex, race and ethnicity, marital status, living arrangement, participants' highest level of education completed, household's total income from all sources before taxes and deductions in 2019, and self-rated physical health. Given that data were collected during the COVID-19 pandemic, we also controlled for the impact of COVID-19 which was a self-report measure.

Statistical Analysis

We first ran descriptive statistics for the data, then used confirmatory factor analysis (CFA) to test a four-factor

Table 1 Estimated descriptive statistics among main study variables for the overall sample

Variables (range)	Unweighted N	Unweighted mean (SD)/percentage (%)	Weighted mean (SD)/percentage (%)
Age (18–64)	4014	40.6 (13.7)	40.7 (13.8)
Sex			
Male	1941	48.4%	48.8%
Female and other non-binary	2073	51.6%	51.2%
Race			
NH White	2409	60.0	60.1
NH Black	536	13.4	13.4
Hispanic	748	18.6	18.5
Other race	321	8.0	8.0
Marital status			
Married / member of an unmarried couple	2081	51.9%	50.1%
Others (single, never married; divorced, separated, or widowed)	1928	48.0%	49.8%
Missing	5	0.1%	0.1%
Education			
Less than high school	194	4.8%	10.5%
High school graduate	1029	25.6%	27.8%
Some college or associate's degree	1306	32.5%	30.4%
Bachelor's degree or more	1482	36.9%	31.1%
Missing	3	0.1%	0.2%
Household income			
Less than $24,999	1101	27.4%	28.3%
$25,000–49,999	928	23.1%	23.6%
$50,000–74,999	629	15.7%	15.1%
$75,000–99,999	451	11.2%	10.8%
More than $100,000	728	18.1%	17.4%
Missing	177	4.4%	4.9%
COVID–19 impact			
Having a positive impact / not affected	2320	57.8%	57.2%
Having a negative impact	1684	42.0%	42.5%
Missing	10	0.2%	0.3%
Self-rated physical health (1–5)			
Poor	281	7.0%	7.4%
Fair	807	20.1%	20.3%
Good	1317	32.8%	33.1%
Very good	1056	26.3%	25.0%
Excellent	517	12.9%	13.0%
Missing	36	0.9%	1.2%
Living arrangement			
Living with others	3229	80.5%	79.6%
Living alone	767	19.1%	19.9%
Missing	18	0.4%	0.5%
Loneliness			
Item 1: You lack companionship (1–4)	3916	2.4 (1.0)	2.4 (1.0)
Item 2: You feel left out (1–4)	3935	2.5 (1.0)	2.5 (1.0)
Item 3: You feel isolated from others (1–4)	3922	2.5 (1.0)	2.5 (1.0)
Mental distress			
Item 1: bothered by having little interest or pleasure in doing things (0–3)	3936	1.0 (1.0)	1.0 (1.0)
Item 2: bothered by feeling down, depressed, or hopeless (0–3)	3951	1.0 (1.0)	1.0 (1.0)

Table 1 (continued)

Variables (range)	Unweighted *N*	Unweighted mean (SD)/percentage (%)	Weighted mean (SD)/percentage (%)
Item 3: bothered by feeling nervous, anxious, or on edge (0–3)	3953	1.0 (1.0)	1.1 (1.0)
Item 4: bothered by not being able to control worrying (0–3)	3923	1.0 (1.1)	1.0 (1.1)
Psychological resilience			
Item 1: I tend to bounce back quickly after hard times (1–5)	3968	3.7 (1.1)	3.7 (1.1)
Item 2: I have a hard time making it through a stressful event* (1–5)	3964	3.0 (1.3)	3.0 (1.3)
Item 3: It does not take me long to recover from a stressful event (1–5)	3962	3.4 (1.2)	3.4 (1.2)
Item 4: It is hard for me to snap back when something bad happens*(1–5)	3950	3.2 (1.2)	3.2 (1.2)
Item 5: I usually come through difficult times with little trouble (1–5)	3950	3.3 (1.1)	3.3 (1.1)
Item 6: I tend to take a long time to get over setbacks in my life* (1–5)	3934	3.1 (1.2)	3.1 (1.2)
Perceived social support			
Is there someone you could count on if you needed a loan for $200?			
Yes	2711	67.5%	65.7%
No	964	24.2%	25.5%
Missing	339	8.4%	8.8%
Is there someone you could count on if you needed a place to live?			
Yes	2928	72.9%	71.7%
No	672	16.7%	17.6%
Missing	414	10.3%	10.6%
How much are friends or relatives willing to listen when you need to talk about your worries or problems?			
Not at all	290	7.2%	7.5%
A little	783	19.5%	20.0%
Some	1248	31.1%	30.9%
A great deal	1575	39.2%	38.5%
Missing	118	2.9%	3.0%

SD standard deviation, *NH* non-Hispanic

*Indicates reverse coding of the responses

measurement model (Fig. 1) and evaluated the convergent and discriminant validity of the four latent constructs (shown as ovals in Fig. 1) [48, 49]. Convergent validity is evaluated based on the factor loadings of their respective hypothesized latent factors while discriminant validity is examined via the correlation between latent constructs [50]. Next, we conducted a structural equation model (SEM) without the latent interaction term to test the main effects of loneliness, perceived social support, and psychological resilience on mental distress with all covariates included in the model. This step allowed us (a) to compare the model fit between the model without the latent interactions and the next model with the latent interactions wherein Mplus does not provide conventional fit indices and (b) to compute the effect size of the interaction effects [51]. As recommended by Dawson [52], we used Cohen's f^2 to report the proportion of residual variance in the latent dependent variable accounted for by the latent interaction, over and above what was accounted for by the main effects and other control variables [53]. Last, we estimated the two hypothesized latent interaction effects one by one using latent moderated structural (LMS) models [54]. When the interaction effect was significant, we used simple slope analyses (one standard deviation [SD] above and below the mean of the moderator) and probed the interaction effect to interpret the latent interaction effect [55]. We chose the latent variable modeling approach for testing interactions mainly because the traditional and standard regression analysis method for interaction estimation—including the product of the sum scores of the independent variable and the moderator—has been limited for several reasons. For example, regression using sum/mean scores does not account for measurement errors of the imperfectly measured psychological constructs which may attenuate the true strength of the interaction effect [56]. We used the full information maximum likelihood estimation method to handle missing data, which enabled the full usage of all available data [57]. All SEM analyses were conducted using Mplus Version 8 [57].

Table 2 Results for the structural equation model without/with latent interactions

	SEM without latent interaction	SEM with latent interaction—resilience	SEM with latent interaction—social support
	Mental distress	Mental distress	Mental distress
	b (SE)	b (SE)	b (SE)
Predictors			
Loneliness	0.46 (0.04) ***	0.47 (0.04) ***	0.49 (0.04) ***
Perceived social support	− 0.04 (0.06)	0.03 (0.07)	0.02 (0.07)
Psychological resilience	− 0.37 (0.04) ***	− 0.44 (0.07) ***	− 0.37 (0.04) ***
Covariates			
Age (18–64)	− 0.01 (0.001) ***	− 0.01 (0.001) ***	− 0.01 (0.001) ***
Female[a]	− 0.01 (0.02)	− 0.01 (0.02)	− 0.01 (0.02)
Not non-Hispanic White[b]	− 0.03 (0.03)	− 0.01 (0.03)	− 0.02 (0.03)
Marital status (others)[c]	− 0.08 (0.03) **	− 0.07 (0.03) **	− 0.08 (0.03) **
Education	− 0.04 (0.02) **	− 0.05 (0.02) **	− 0.04 (0.02) **
Household income	− 0.01 (0.01)	− 0.003 (0.01)	− 0.01 (0.01)
COVID-19 negative impact[d]	− 0.13 (0.02) ***	− 0.12 (0.02) ***	− 0.13 (0.02) ***
Self-rated physical health	− 0.06 (0.01) ***	− 0.05 (0.01) ***	− 0.06 (0.01) ***
Living alone[e]	− 0.02 (0.03)	− 0.02 (0.03)	− 0.02 (0.03)
Latent interaction effects			
Loneliness × psychological resilience		− 0.32 (0.04) ***	
Loneliness × perceived social support			− 0.42 (0.08) ***
R^2	0.572	0.639	0.587
Cohen's f^2		0.19	0.04

Parameters are unstandardized

** $p < 0.01$; *** $p < 0.001$

[a] Reference group: male

[b] Reference group: non-Hispanic White

[c] Reference group: married/member of an unmarried couple; others = single, never married; divorced, separated, and widowed

[d] Reference group: having a positive impact/not affected

[e] Reference group: living with others

Results

Descriptive Analyses

Table 1 displays the demographic characteristics of the participants. The mean age was 40.7 ± 13.8 years old. Of the 4014 participants, 2040 (50.4%) were female. Over one third of the respondents were single or never married (33.6%), and had a bachelor's degree or higher (31.1%). Nearly 42% reported that COVID-19 had a negative impact on their lives, and 20% reported living alone. Means and percentages were weighted.

Measurement Model Estimation

We tested a four-factor measurement model (Fig. 1), in which the 16 observed indicators loaded on four hypothesized factors. The measurement model fit the data very well: $\chi^2(82) = 189.40$, $p = 1.71$, comparative fit index (CFI) = 0.99, root-mean-square error of approximation (RMSEA) = 0.018 [0.015, 0.021], and standardized root-mean-squared residual (SRMR) = 0.020. All unstandardized factor loadings of indicators on their respective hypothesized latent factors were strong and significant ($p < 0.001$), and all standardized factor loadings were all greater than the fair factor loading cut-off of 0.45 suggested by Tabachnich and Fidell [58]. The factor loadings of all indicators and Cronbach's α (above 0.81) are summarized in Electronic Supplemental Material Table 1. The standardized factor loadings ranged from 0.47 to 0.89 ($p < 0.001$) across variables. Further, the correlation coefficients among all latent variables ranged from |− 0.42| to |0.66|, indicating that these were four distinct variables. Taken together, the CFA results provided support for both convergent and discriminant validity. Thus, we included the configuration
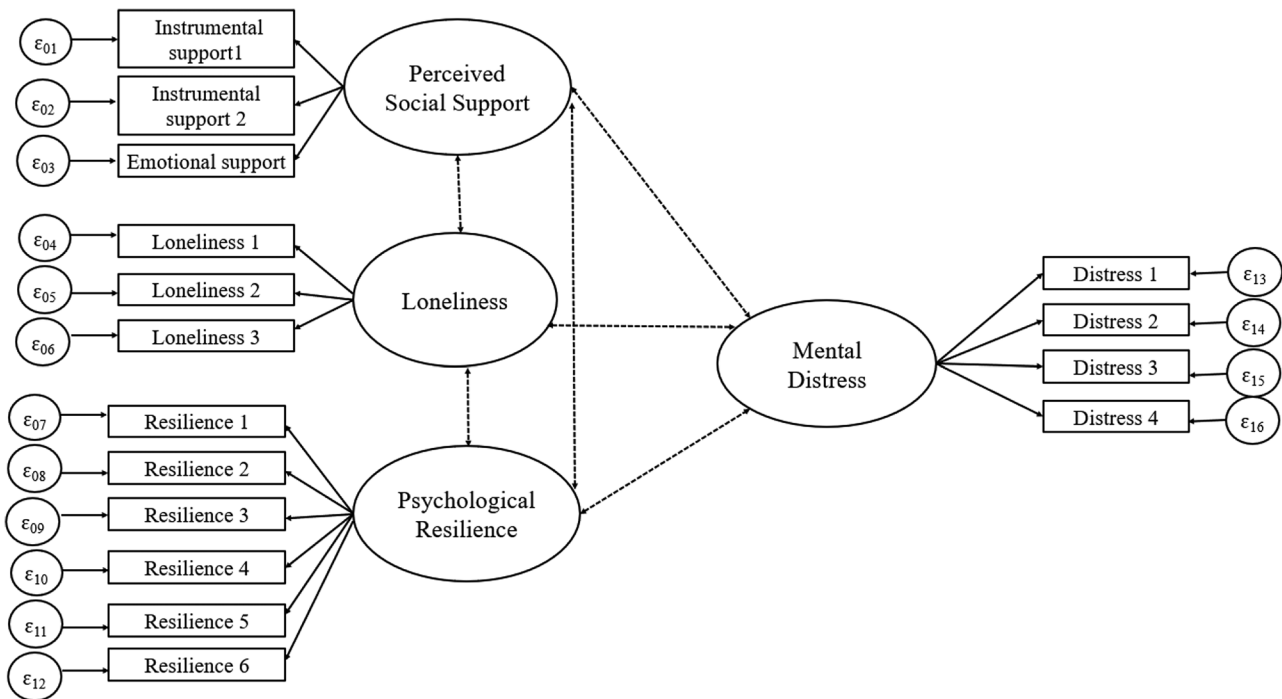
Fig. 1 The four-factor measurement model. *Note*: Ovals correspond to latent variables; rectangles, to observed variables; ε, to measurement error; and dashed lines, to latent covariances

of the indicators on these four latent factors established in the measurement model in the subsequent analyses.

Main Effects of Loneliness, Psychological Resilience, and Perceived Social Support on Mental Distress

The structural model had a good fit: $\chi^2(190) = 680.64$, $p < 0.001$, CFI = 0.974, RMSEA = 0.025 [0.023, 0.027], SRMR = 0.023. As hypothesized, we found that the main effects of loneliness ($b = 0.46$, SE = 0.04, $p < 0.001$, $\beta = 0.38$) and psychological resilience ($b = -0.37$, SE = 0.04, $p < 0.001$, $\beta = -0.33$) on mental distress were significant after adjusting all covariates (see Table 2 for coefficients for all control variables). However, the main effect of perceived social support ($b = -0.04$, SE = 0.06, $p = 0.58$, $\beta = -0.02$) on mental distress was not significant.

The Buffering Effects of Psychological Resilience and Perceived Social Support

We first evaluated the model fit of the LMS model by comparing the model fit of the models with and without the latent interaction term using the Satorra-Bentler scaled chi-square difference test TRd [54]. The differences in scaled loglikelihood were significant (psychological resilience: *TRd* ($df = 1$) = 65.87, $p < 0.0001$, and perceived social support: *TRd* ($df = 1$) = 30.02, $p < 0.0001$), indicating that LMS

models provided better fit to the data than the SEM without the interaction term. Further, we found two significant interaction effects between loneliness and psychological resilience as well as between loneliness and perceived social support on mental distress. Unstandardized interaction coefficients are presented in Table 2. The interaction between loneliness and psychological resilience was also significant: $b = -0.32$, SE = 0.04, $p < 0.001$, $\beta = -0.17$. As shown in Fig. 2, loneliness was more strongly associated with mental distress when psychological resilience was lower (vs. higher). Specifically, the simple slope test revealed that when psychological resilience was one SD below the mean, the effect of loneliness on mental distress was statistically significant ($b = 0.66$, SE = 0.05, $p < 0.001$). When psychological resilience was one SD above the mean, the effect of loneliness on mental distress was also statistically significant ($b = 0.25$, SE = 0.04, $p < 0.001$), but weaker than that when psychological resilience was one SD below the mean. The inclusion of the latent interaction term (loneliness × psychological resilience) accounted for an additional 6.7% of the variances in mental distress with a medium effect size $f^2 = 0.19$.

There was a significant interaction between loneliness and perceived social support: $b = -0.42$, SE = 0.08, $p < 0.001$, $\beta = -0.11$. As shown in Fig. 3, loneliness was more strongly associated with mental distress when adults' perceived social support was lower (vs. higher). Specifically, the simple slope

Fig. 2 Standardized effects of loneliness and mental distress conditional on psychological resilience. *Note*: When psychological resilience is lower, the positive association between loneliness and mental distress is stronger
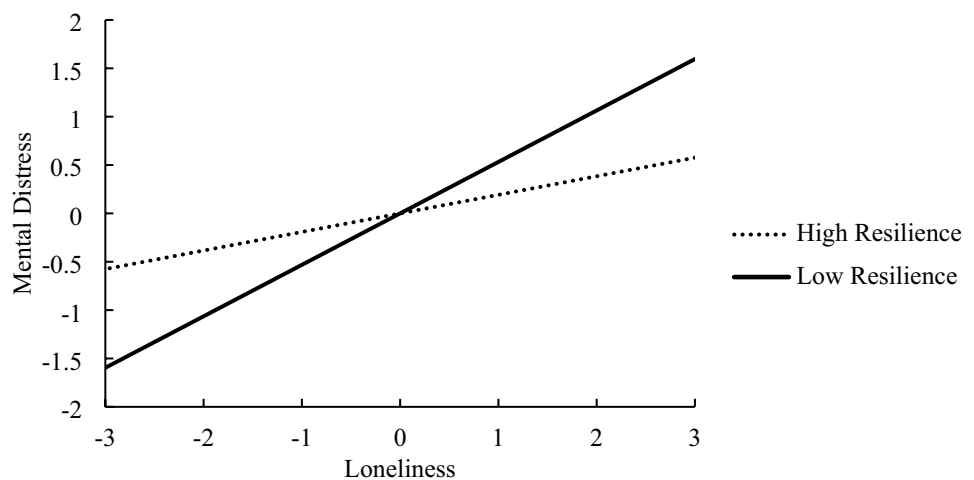
test revealed that when perceived social support was one SD below the mean, the effect of loneliness on mental distress was statistically significant ($b = 0.60$, SE $= 0.05$, $p < 0.001$). When perceived social support was one SD above the mean, the effect of loneliness on mental distress was also statistically significant ($b = 0.34$, SE $= 0.04$, $p < 0.001$), but weaker than that when perceived social support was one SD below the mean. The inclusion of the latent interaction term (loneliness $\times$ perceived social support) accounted for an additional 1.5% of the variances in mental distress with a small effect size $f^2 = 0.04$.

Discussion

Loneliness is prevalent among adults and has been conceptually and empirically linked to a myriad of mental health problems, such as depressive symptoms and anxiety [1, 7, 12, 13]. Given that the ongoing pandemic will likely continue to influence feelings of loneliness [4, 59], it

is imperative to provide public health professionals and other practitioners with empirical evidence about what factors buffer the relationship between loneliness and mental distress, which can further help them identify and select appropriate intervention and prevention strategies. We drew on the social ecology of resilience [17], and examined working-age adults' psychological resilience and perceived social support as two types of resilience factors and investigated them as moderators between loneliness and mental distress.

Results supported prior research by demonstrating that loneliness was a risk factor for mental distress among working-age adults [12]. Specifically, we found that higher levels of loneliness were associated with elevated mental distress after controlling for age, gender, race and ethnicity, education, income, marital status, living arrangement, self-reported physical health, and COVID-19 impact as well as the two psychosocial factors: psychological resilience and perceived social support. This finding supports the stress model which posits loneliness as a common stressor is associated with poor mental health outcomes [60].

Fig. 3 Standardized effects of loneliness and mental distress conditional on perceived social support. *Note*: When perceived social support is lower, the positive association between loneliness and mental distress is stronger
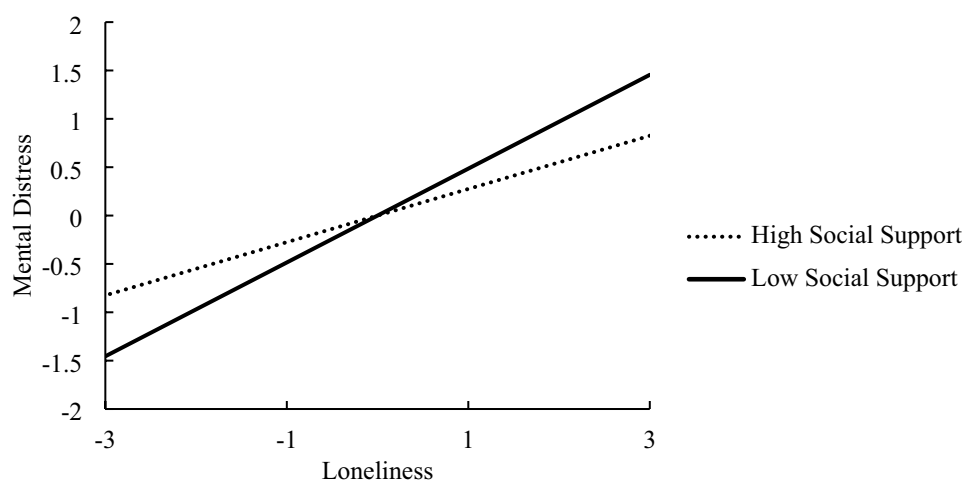
Our findings also shed light on differences in the relationship between loneliness and distress among working-age adults. We found that, when individuals were more resilient or in the context of high social support, the strength of the relationship between loneliness and mental distress was weaker, suggesting that psychological resilience and perceived social support are protective factors. Prior studies suggest that adults who are psychologically resilient tend to have the ability to perform adaptive functioning when under stress or feeling lonely [22, 61, 62], and this ultimately helps them maintain a steady mental state or healthy process despite adversity [29]. Given that psychological resilience can be learned [27] and the protective role of psychological resilience in well-being and coping in the presence of stress, universal campaigns or interventions that foster psychological resilience are urgently needed to protect the mental health of American adults. These findings highlight the importance of fostering working-age adults' psychological resilience as it is modifiable and can be enhanced through psychological therapy interventions (e.g., mindfulness-based therapies, tai chi qigong meditation, and visual art discussions) [41, 42, 63], which in turn appear to offer protection against loneliness [64, 65]. A recent comprehensive meta-analysis of 268 studies on the overall efficacy of resilience interventions concluded that "resilience-promoting interventions yielded a small, but statistically significant overall effect" [64].

Our finding that perceived social support is a protective factor further confirms the social support and buffering theory [37] which posits that support protects against the negative effects of loneliness and promotes mental health. However, it is worth noting that the effect size of the perceived social support interaction effect is relatively small, suggesting that it may be of little practical significance. Indeed, effective interventions designed to improve perceived social support are limited despite theory and a large body of literature pointing to the benefits of perceived social support in mental health. Psychoeducation is a common approach used by practitioners or clinicians to improve individual's perceived social support; however, the effectiveness is mixed [66]. Therefore, further development and testing of interventions of this kind are warranted, and our study findings might have implications for informing these efforts.

Some limitations should be considered when evaluating the implications of the study findings. First, the data used in the current study were collected through an online survey and thus may be subject to selection bias as online surveys require internet access. However, prior research has documented that Qualtrics is a credible platform that can collect representative national data especially when post-stratification weights are used [67]. Moreover, other studies using this dataset have reported comparable univariate estimates to other national representative survey datasets [68].

Second, this is a cross-sectional study. Although the existing literature guided us to make hypotheses regarding the direction of the relationships between study variables, causal implications cannot be assumed. Therefore, future studies using a longitudinal, rather than cross-sectional, design may provide better inferences about the direction of relationships. Third, we used self-reported measures, which were not clinical diagnoses. Given the unfeasibility of conducting clinical diagnoses in a large sample, we used well-established and self-reported measures. Future studies are needed to use multiple measures in addition to self-reported assessment. Finally, although we included the perceived impact of COVID-19 as a covariate, it was assessed using a single-item measure. Future studies should further examine whether the relationship between loneliness and mental distress is conditioned on different life domains impacted by COVID-19.

In conclusion, our study highlights the importance of psychological resilience and perceived social support as two protective factors in the relationship between loneliness and mental distress for U.S. working-age adults amidst the COVID-19 pandemic. Given that loneliness is predictive of mental and physical health and higher mortality [11], identifying protective factors that might disrupt these connections is vital. As such, public health efforts to strengthen and expand familial and community social support networks and foster psychological resilience will be essential to supporting mental health during additional waves of the pandemic or future similar stressors.

Declarations

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