



# The Role of Trait Mindfulness in the Association between Loneliness and Psychological Distress

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## Abstract

**Objectives** Loneliness is associated with elevated psychological distress. This study examined whether trait mindfulness mediates or moderates the positive association between loneliness and psychological distress.

**Method** A convenience sample of 297 adults (79.1% female, 20.5% male) aged 18 to 75 years ( $M = 38.38$ ,  $SD = 11.31$ ) completed an online questionnaire that assessed loneliness, trait mindfulness and its facets (Non-Judging, Awareness, Non-Reactivity, Describing, Observing), and psychological distress (depression, anxiety, stress).

**Results** Mediation analysis identified an indirect path from loneliness to psychological distress through trait mindfulness. Participants who reported greater loneliness reported lower trait mindfulness that, in turn, tended to associate with greater psychological distress. Multiple mediation analysis found indirect paths via Non-Judging, Awareness, Non-Reactivity, and Describing. Moderation analysis found that the association between loneliness and psychological distress was significant for participants with low trait mindfulness but non-significant for those with high trait mindfulness. However, analysis of the mindfulness facets as simultaneous moderators found that no facet individually moderated the association. Rather, all contributed to a cumulative interactive role of the composite mindfulness construct. A supplementary analysis found that lower levels of loneliness mediated the association between mindfulness and psychological distress.

**Conclusions** A tendency to respond to loneliness with low levels of Non-Judging, Awareness, Non-Reactivity, and Describing may exacerbate distress. These results suggest that future research may benefit from investigating whether interventions that increase these mindfulness facets may mitigate psychological distress associated with loneliness.

**Keywords** Loneliness · Mindfulness · Psychological distress · Non-judging · Awareness · Non-reactivity

The deleterious state of loneliness has become such a prolific problem in western society that it has been described as an epidemic (Jeste et al., 2020). *Loneliness* is defined as the negative emotional response to a discrepancy between a person's actual and desired social interactions and relationships (Cacioppo et al., 2006a). Unlike social isolation, loneliness can be present when alone or with company, as it involves perceived rather than actual separation from others (Cacioppo et al., 2006a; Hawkley & Cacioppo, 2010). Jeste et al. (2020) outlined various factors that have contributed to the escalation of loneliness over recent decades, including societal changes, increased globalization, and greater reliance on technology for social connection. They

suggested the shift toward online communication has disrupted traditional relationships and increased harmful social interactions. Furthermore, a study including 20,398 participants from 101 countries suggests that enforced social isolation measures to combat COVID-19 led to an increase in the prevalence of severe loneliness from 6 to 21% (O'Sullivan et al., 2021).

Loneliness has a sociological function, but it is inherently distressing. Cacioppo et al.'s (2006a) evolutionary theory of loneliness proposes that because isolation was risky for our ancestors, being alone triggers emotional distress to motivate efforts for social connection. However, this heightened risk perception is thought to induce hypervigilance, stress, and anxiety, leading to perceived threat in otherwise benign social interactions or circumstances, consequently increasing the likelihood of social avoidance. This process is theorized to create a feedback loop in which social avoidance exacerbates loneliness and associated psychological distress, which

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further encourages social avoidance; a cycle that continuously amplifies loneliness, psychological distress, and social avoidance. Relatedly, psychological distress has been associated with focusing on thoughts, feelings, and situations that are perceived as harmful (Morrison & O'Connor, 2008). It is often quantified by the severity of symptoms associated with depression, anxiety, and stress (Medvedev et al., 2018).

Extensive research has linked loneliness with greater psychological distress, including higher symptoms of depression (Cacioppo et al., 2006b), anxiety (Zawadzki et al., 2013), and stress (Newby et al., 2020). Meta-analytic research has found a strong association between loneliness and depression in both adolescent (Mahon et al., 2006) and adult (Nolen-Hoeksema & Ahrens, 2002) samples. Furthermore, longitudinal evidence suggests that loneliness has persistent implications for subsequent mental health. In a 3-year study, Cacioppo et al. (2006b) found that loneliness levels in year 1 predicted depression in later years. Similarly, using data collected annually over 5 years, VanderWeele et al. (2011) found that the severity of depressive symptomatology was strongly associated with loneliness levels from the preceding 2 years.

As well as involving emotional pain and suffering (Morrison & O'Connor, 2008), psychological distress has been associated with serious health outcomes (Russ et al., 2012). For example, elevated symptoms of psychological distress have been associated with increased risk of incident arthritis, cardiovascular disease, chronic obstructive pulmonary disease (McLachlan & Gale, 2018), and higher mortality (Russ et al., 2012). Further, psychological distress has been linked to increased time off work, reduced productivity and loss of revenue (Ling et al., 2016). Therefore, psychological distress arising from loneliness can have significant ongoing implications at an individual and societal level.

For these reasons, it is important to develop strategies that minimize the detrimental effects of loneliness on psychological distress. Effective strategies could target mechanisms of this association. Previous research has identified several factors that may buffer the positive association between loneliness and adverse mental health outcomes, including self-compassion (Andel et al., 2021), personal resilience (Mäkiniemi et al., 2021), and spouse support (Son et al., 2022). Additionally, rumination has been found to both moderate and mediate the association between loneliness and depression (Vanhalst et al., 2012; Zawadzki et al., 2013), and trait equanimity has mediated the association between perceived isolation and psychological distress (Mann & Walker, 2022). Extending these findings, the current study explored the role of trait mindfulness as a mechanism in the loneliness-psychological distress association.

Although originally stemming from Buddhism, the Western concept of *mindfulness* has been defined as the conscious focus of awareness and attention on the present moment,

with an attitude of open curiosity and non-judgmental acceptance (Bishop, 2004). Rather than denying unpleasant thoughts, mindfulness involves recognizing uncomfortable content without attachment, with attention then drawn back to the current experience (Bishop, 2004).

Mindfulness is delineated into *trait mindfulness*, the tendency to be mindful across time and situations, and *state mindfulness*, the degree of mindfulness at a particular point in time (Kiken et al., 2015). State mindfulness has been found to more strongly influence the present experience, while trait mindfulness has a greater impact on long-term mental health outcomes. Research suggests that increasing state mindfulness through meditation and mindfulness-based interventions increases the enduring resource of trait mindfulness (Kiken et al., 2015), which can then be applied to everyday life.

Baer et al. (2006) developed the Five Facet Mindfulness Questionnaire (FFMQ) to measure trait mindfulness by performing factor analysis on the pooled items from five commonly used trait mindfulness scales. This process identified five mindfulness facets: Non-Reactivity (non-reactivity to inner experience), Observing (observing and noticing aspects of one's experience), Awareness (acting with awareness), Describing (describing one's experience with words), and Non-Judging (non-judgement of inner experience). The FFMQ is widely used in mindfulness research as it assesses both overall trait mindfulness as well as levels of each individual facet. This allows researchers to undertake more detailed analyses which explore the relative roles of the mindfulness facets in relation to other variables.

Negative correlations between loneliness and trait mindfulness have been found in samples of adolescents ( $r = -0.41$ ; Clear et al., 2020) and young adults ( $r = -0.40$ ; Kingery et al., 2021). Mindfulness intervention studies have shown that increasing mindfulness can decrease loneliness (Creswell et al., 2012; Zhang et al., 2018). While no previous study has examined whether increases in loneliness may decrease mindfulness, this effect is supported by several other related findings. When people experience loneliness, they tend to engage in cognitive processes that are conceptually incompatible with mindfulness. These processes are known to include suppressing emotions, blaming the self and others, socially withdrawing, and using fewer adaptive strategies such as cognitive reappraisal (Preece et al., 2021). In particular, loneliness has been associated with greater rumination, which involves repeatedly and habitually focusing on distressing or negatively evaluated thoughts, feelings, and experiences, dwelling on their causes and consequences, and diverting attention away from the present-moment to past experience and possible future outcomes (Kingery et al., 2021). These psychological processes directly contrast with mindfulness, which is supported by the finding that rumination and trait mindfulness are usually strongly negatively correlated

( $r = -0.52$ ; Kingery et al., 2021). Vanhalst et al. (2012) analyzed separate components of rumination as mediators of the association between loneliness and symptoms of depression. They found that the uncontrollable nature of ruminative thoughts had a greater impact on depressive symptoms than did the content. Further, Raes and Williams (2010) found a weaker association between total rumination and uncontrollable rumination among individuals with high dispositional mindfulness. This suggests that mindfulness may protect individuals from entering destructive rumination cycles.

In contrast, research findings suggest that people with low levels of trait mindfulness tend to experience relatively poor outcomes when they face adversity. For example, lower trait mindfulness has been found to mediate the predictive effects of early life adversity on poor self-regulation (Brett et al., 2018). Evidence suggests the mediating role of lower mindfulness also extends to the effects of negative social experiences, such as low perceived social support, on depression, stress, dysfunctional attitudes, and wellbeing (Wilson et al., 2020). Most recently, Mann and Walker (2022) found that perceived social isolation during the COVID-19 pandemic was associated with lower trait equanimity that, in turn, was associated with greater psychological distress in a sample of American adults. They defined equanimity as a component of mindfulness involving being receptive and open to thoughts, emotions, and experiences, and being centered within oneself. Drawing on these combined findings, we hypothesized that individuals who tend to respond to loneliness with low levels of trait mindfulness would report higher levels of psychological distress.

Evidence suggests that high levels of mindfulness also serve a role in buffering the impact of adverse life experiences. For example, in adolescents, dispositional mindfulness has been found to moderate the pathway between rejection sensitivity and depression, anxiety, and stress, where high mindfulness reduced the impact of high rejection sensitivity on later mental health problems (Yu et al., 2021). Similarly, Liu et al. (2022) found lower mindfulness related to greater risk of anxiety and depression among students who were experiencing acculturative stress. Based on these findings, we hypothesized that when an individual experiences loneliness, higher levels of trait mindfulness may protect them against symptoms of psychological distress.

Greater mindfulness has been associated with lower psychological distress (Carpenter et al., 2019). Carpenter et al. (2019) conducted a meta-analysis of 148 studies and a pooled sample of 44,075 participants from diverse populations. They found that trait mindfulness had a large mean inverse predictive effect on negative affective symptoms including depression, anxiety, and related disorders ( $r = -0.53$ ). Importantly, outcomes of mindfulness interventions have indicated that the effects may be causal. A meta-analysis of 29 studies with a total of 2,668 healthy participants found that engaging in

mindfulness-based stress reduction (MBSR) interventions reduced symptoms of depression, stress, anxiety, and overall psychological distress (Hedges'  $g = 0.62$  to  $0.80$ ; Khoury et al., 2015). Another meta-analytic study found that mindfulness-based cognitive therapy (MBCT) interventions significantly reduced the likelihood of relapse for individuals with major depressive disorder by 34% (Piet & Hougaard, 2011). Additionally, an intervention that combined aspects of both MBSR and MBCT increased the ability to let go of negative automatic thoughts, and decreased depression and anxiety (Frewen et al., 2008). These intervention findings demonstrate that mindfulness causally influences symptoms of psychological distress and inhibits maladaptive thought processes.

Of the FFMQ facets, Non-Judging, Awareness, and Non-Reactivity have exhibited the strongest negative associations with psychological distress (Kingery et al., 2020; Medvedev et al., 2018). Non-Reactivity and Non-Judging have also been found to uniquely predict perceived stress and emotional well-being (Kingery et al., 2020) and along with Awareness are the strongest predictors of depression, stress, and anxiety (Medvedev et al., 2018). These findings suggest that by maintaining present moment awareness, with non-judgement and inhibition of emotional reactivity, psychological distress may be reduced.

Findings regarding the facet of Describing have been inconsistent. For example, Baer et al. (2006) found that Describing was associated with measures of psychological distress, while Medvedev et al. (2018) found these associations varied depending on the sample and were not significant when controlling for demographic variables. This inconsistency may occur because greater ability to describe one's experience does not necessarily mean this is being done from a non-judgmental stance, thus the scale may not capture the concept in the way it was intended (Baer, 2011).

The facet of Observing has also demonstrated inconsistent or weak links with psychological distress (Baer et al., 2006; Carpenter et al., 2019; Medvedev et al., 2018). High levels of Observing have been associated with detrimental outcomes, such as increased suicide risk for individuals with PTSD (Cheng et al., 2018; Stanley et al., 2019). These unexpected associations may occur because Observing does not capture the valence of what is being observed. For example, in the case of PTSD, Cheng et al. (2018) proposed that high scores on Observing may reflect increased hypervigilance toward potentially threatening stimuli. Overall, these findings suggest that trait mindfulness lowers psychological distress, and the key mitigating mindfulness facets may be Non-Judging, Awareness, and Non-Reactivity.

Limited research has explored the links between loneliness and the individual mindfulness facets, with no research investigating an adult sample. Zimmer-Gembeck et al. (2021) investigated whether significant correlations between

loneliness and mindfulness may reflect an inverse causal association in which mindfulness reduces loneliness. Using an adolescent sample, they found that loneliness was negatively associated with the facets of Awareness, Non-Judging, Non-Reactivity, and Describing, with correlations of -0.24, -0.29, -0.23, and -0.30, respectively. Further, mediation analyses found that these four facets were indirectly associated with less loneliness, social anxiety, and depression via stronger stress coping responses. However, the Observing subscale was excluded from their analysis. Overall, extant research findings suggest that the mindfulness facets of Awareness, Non-Judging, Non-Reactivity, and Describing may be expected to negatively correlate with loneliness in an adult sample; but only Non-Judging, Non-Reactivity, and Awareness have been consistently associated with psychological distress. Therefore, these three facets may play key roles in the association between loneliness and psychological distress.

Based on the above literature review, the present study examined whether trait mindfulness plays a role in the association between loneliness and psychological distress. First, mediation analyses evaluated whether a tendency to respond to loneliness with low levels of mindfulness is associated with greater psychological distress, and which facets of mindfulness drive that indirect effect. Second, moderation analyses assessed whether high levels of trait mindfulness buffer the detrimental predictive effects of loneliness on greater psychological distress, and which mindfulness facets drive that buffering role when assessed as simultaneous moderators. No previous research has examined mindfulness or its facets as mediators or moderators of the association between loneliness and psychological distress. A supplementary analysis examined whether loneliness acts as a mechanism in the association between mindfulness and psychological distress.

We expected to find a positive association between loneliness and psychological distress, and negative associations between loneliness and trait mindfulness and between trait mindfulness and psychological distress. We further hypothesized that trait mindfulness would mediate the association between loneliness and psychological distress, and that the FFMQ mindfulness facets would differentially mediate the loneliness-psychological distress association, with indirect paths via lower levels of Non-Judging, Awareness, and Non-Reactivity exhibiting the strongest effects. We further hypothesized that trait mindfulness would moderate the association between loneliness and psychological distress, where participants with higher levels of mindfulness would report lower levels of distress than did participants with lower levels of mindfulness. Additionally, we expected that the FFMQ mindfulness facets would differentially moderate the loneliness-psychological distress association, where Non-Judging,

Awareness, and Non-Reactivity would exhibit the strongest effects. Finally, we formed the supplementary hypothesis that lower levels of loneliness would mediate the negative association between trait mindfulness and psychological distress.

## Method

### Participants

Community members were recruited via Facebook and first-year psychology students were invited to participate for course credit. Eligibility criteria included being aged 18 or older, English literacy, and provision of informed consent. Following exclusion of 31 (9.5%) respondents by the screening procedures reported in the Results section, the final sample consisted of 297 adults aged 18 to 75 years ( $M = 38.38$ ,  $SD = 11.31$ ), including 235 (79.1%) females, 61 (20.5%) males, and 1 other (0.3%). The sample comprised 224 students and 73 community respondents, most of whom were Australian residents (93.9%). Demographic details of the pooled sample and two subsamples are reported in Table 1 and Supplementary Table S1, respectively.

As shown in Supplementary Table S1, the proportions of females versus males were similar in the student and community subsamples. A chi-square test of independence indicated that gender (male or female) was not associated with subsample group membership,  $\chi^2(1, 296) = 0.12$ ,  $p = 0.728$ . However, another chi-square test of independence showed that age and subsample group membership were significantly associated,  $\chi^2(74, 297) = 106.70$ ,  $p = 0.008$ . The student subsample was on average 6.60 years younger compared to members of the community sample, but median ages for the student and community samples were very similar at 37 and 39, respectively. Due to the small size of the community subsample, there was inadequate power to examine the subsamples separately for the mediation and moderation analyses; consequently, they were pooled for the analyses. The inclusion of age as a covariate controlled for potential effects of the subsample age difference.

The sample size exceeded the minimum of 160 estimated by an a priori power analysis in G\*Power 3.1 for a linear multiple regression using 8 predictors, a medium effect size of  $f^2 = 0.15$ , target power of 0.95, and alpha of 0.05. However, it was smaller than required for the mindfulness facets moderation analysis. To address this issue, we performed that analysis using bias-corrected confidence intervals from 5000 bootstrap replicates; a procedure that improves power in small samples (Preacher & Hayes, 2008).

**Table 1** Participant demographics including means and standard deviations for primary measures

Demographic	<i>n</i>	% <sup>1</sup>	Loneliness <i>M (SD)</i>	Mindfulness <i>M (SD)</i>	Psychological Distress <i>M (SD)</i>
<b>Sex</b>					
Female	235	79.1	46.43 (10.35)	79.02 (13.13)	34.80 (25.08)
Male	61	20.5	45.93 (10.86)	80.02 (12.70)	33.70 (24.14)
Other	1	0.3	–	–	–
<b>Age</b>					
18–29	65	21.9	47.12 (10.36)	73.38 (11.50)	49.09 (28.40)
30–39	110	37.0	47.37 (10.41)	77.39 (11.67)	34.84 (22.80)
40–49	78	26.3	47.01 (10.26)	81.59 (13.34)	29.90 (21.74)
50–59	34	11.4	42.65 (10.05)	87.85 (13.06)	23.65 (18.78)
60–69	6	2.0	36.50 (8.46)	91.00 (4.24)	10.33 (9.24)
70–75	4	1.3	39.50 (10.38)	92.50 (15.20)	9.00 (4.76)
<b>Relationship status</b>					
Single	107	36.0	49.32 (10.50)	78.30 (13.28)	38.50 (24.94)
Partnered	190	64.0	44.69 (10.04)	79.85 (12.94)	32.30 (24.54)
<b>Living arrangements</b>					
Lives alone	41	13.8	49.46 (11.79)	77.95 (13.64)	39.80 (26.20)
Lives with others <sup>2</sup>	256	86.2	45.86 (10.14)	79.51 (12.98)	33.69 (24.55)
<b>Highest education</b>					
Some high school	2	0.7	44.50 (14.85)	67.00 (5.66)	87.00 (15.56)
Year 10	3	1.0	59.33 (9.24)	78.33 (7.02)	54.00 (22.54)
Year 12 / Higher School Certificate	33	11.1	49.94 (10.55)	73.70 (11.97)	45.73 (26.44)
TAFE <sup>3</sup> or trade	71	23.9	47.18 (10.52)	76.82 (13.19)	39.27 (23.68)
3-year university	51	17.2	46.31 (10.24)	81.57 (12.85)	30.31 (23.33)
4-year university	34	11.4	43.94 (9.85)	82.03 (13.67)	29.59 (26.18)
Some postgraduate study	51	17.2	46.65 (10.18)	80.10 (13.45)	32.35 (23.05)
Master's degree	48	16.2	44.17 (10.15)	81.23 (11.53)	27.83 (23.29)
Doctoral degree	4	1.3	37.00 (9.90)	90.50 (17.14)	21.50 (12.26)
Student Sample	224	75.4	46.92 (10.40)	78.24 (12.63)	35.88 (24.40)
Community Sample	73	24.6	44.63 (10.41)	82.53 (13.89)	30.41 (25.82)
Total Sample	297	100	46.36 (10.43)	79.29 (13.06)	34.54 (24.82)

<sup>1</sup> Percentage of total sample of  $n=297$ . <sup>2</sup> Including people and/or pets. <sup>3</sup> College of Technical and Further Education

## Procedure

A questionnaire was created and hosted online using Qualtrics (<https://www.qualtrics.com>) and accessed via a hyperlink. Following study information and provision of informed consent, participants answered demographic questions and completed measures of loneliness, mindfulness, and psychological distress, which took approximately 14 min.

## Measures

### Loneliness

Loneliness was measured with the University of California Los Angeles Loneliness Scale–Version 3 (UCLA-LS; Russell, 1996). Participants rated how frequently the 20 statements described their feelings (e.g. “How often do you feel

left out?") using a scale from 1 (*Never*) to 4 (*Always*). Negative items were reverse scored, before summing all items. Higher scores indicated greater loneliness. The UCLA-LS has demonstrated strong construct, convergent, and discriminant validity, strong test–retest reliability, and high internal consistency (Russell, 1996). In this study internal reliability was very high ( $\omega=0.94$ ), as was inter-item consistency ( $\alpha=0.94$ ).

### Mindfulness

Trait mindfulness was assessed using the 24-item Five-Facet Mindfulness Questionnaire–Short Form (FFMQ-SF; Bohlmeijer et al., 2011). Participants rated how frequently each statement applied to them (e.g. "I tell myself I shouldn't be thinking the way I'm thinking") on a scale from 1 (*Never or very rarely true*) to 5 (*Very often or always true*). The FFMQ-SF includes subscales for five mindfulness facets; Non-Reactivity, Awareness, Describing, Non-Judging, and Observing. Negative items are reverse-coded before summing subscale items for facet scores and summing all items to assess trait mindfulness (Baer et al., 2006). Higher scores indicate more of the respective quality. The FFMQ-SF has demonstrated good construct, convergent, and discriminant validity and good internal reliability (Bohlmeijer et al., 2011). Internal reliability and inter-item consistency was strong in this sample for all mindfulness facets and the FFMQ total (subsequently referred to as trait mindfulness). Non-Reactivity, Observing, Awareness, Describing, Non-Judging, and the total score had Cronbach's alpha coefficients of 0.84, 0.83, 0.84, 0.87, 0.87, and 0.91, and McDonald's omega coefficients of 0.84, 0.83, 0.84, 0.86, 0.87, and 0.90, respectively.

### Psychological Distress

Psychological distress was measured using the total score of the 21-item Depression, Anxiety, and Stress Scale (DASS-21; Lovibond & Lovibond, 1995). Participants rated how each item applied to them during the prior 7 days (e.g. "I felt downhearted and blue") on a scale from 0 (*Did not apply to me at all*) to 3 (*Applied to me very much or most of the time*). Three subscales measure Depression, Anxiety, and Stress. Scores for the subscales and total are summed and doubled to allow comparison with the 42-item DASS, with higher scores indicating more severe symptoms. The DASS-21 subscales have demonstrated strong construct and convergent validity (Crawford & Henry, 2003), and strong internal reliability, with the total score capturing an overall measure of psychological distress (Henry & Crawford, 2005). Internal reliability and inter-item

consistency was strong in this sample for the three DASS subscales and the DASS total (subsequently also referred to as psychological distress). Depression, Anxiety, Stress, and DASS total scores had McDonald's omega coefficients of 0.92, 0.86, 0.89, and 0.94, and Cronbach's alpha coefficients of 0.92, 0.85, 0.90, and 0.94, respectively.

### Data Analyses

The analyses were conducted using IBM SPSS Statistics (Version 28) and PROCESS (Hayes, 2022). Pearson's bivariate correlations were used to test the following hypotheses: loneliness and psychological distress would be positively associated; loneliness and trait mindfulness would be negatively associated; and trait mindfulness and psychological distress would be negatively associated. To test whether trait mindfulness mediates the association between loneliness and psychological distress, a simple mediation model was used with X–loneliness, M–mindfulness, and Y–psychological distress, controlling for the covariates of age and gender. To evaluate whether the five FFMQ mindfulness facets differentially mediate the association between loneliness and psychological distress, a parallel multiple mediation was used, with X–loneliness, M–Non-Reactivity, Observing, Awareness, Describing, and Non-Judging, and Y–psychological distress, controlling for age and gender. As recommended by Hayes (2022), 5,000 bootstrap samples were applied for bias correction in both mediation analyses. If the 95% confidence interval for an indirect pathway from X to Y does not cross zero, this indicates significance at  $p < 0.05$ , and supports a mediation effect in the respective model.

Two linear regression models were used to assess whether levels of (1) trait mindfulness (FFMQ total score) and (2) the five mindfulness facets (FFMQ subscales) moderated the association between loneliness and psychological distress. As per Cohen et al. (2003), we centered the independent and moderator variables for both analyses, then created interaction terms by calculating the products of loneliness and trait mindfulness (FFMQ total score) and of loneliness and each of the FFMQ mindfulness facets (Non-Reactivity, Observing, Awareness, Describing, and Non-Judging). Bias-corrected confidence intervals for the model coefficients based on 5,000 bootstrap samples were used for the mindfulness facet moderation analysis to improve power (Preacher & Hayes, 2008). The supplementary hypothesis that lower levels of loneliness would mediate the negative association between trait mindfulness and psychological distress was assessed by a simple mediation model, with X–trait mindfulness, M–loneliness, and Y–psychological distress, controlling for the covariates of age and gender.

## Results

### Data Cleaning

Twenty-five participants failed to complete the survey and five had evidence of invalid responding. Consequently, 30 participants were excluded from analyses. For the remaining 298 participants the only variable with missing data was age, which 24 (8%) did not report. Little's MCAR test indicated the values were missing completely at random ( $p=0.446$ ). As such, the missing age values were imputed using Expectation Maximization with 25 maximum iterations. Visual inspection of histograms, box-plots, and Q-Q plots indicated that the distributions for loneliness and the FFMQ-SF scales were normal, but the distribution of psychological distress was positively skewed. A positive skew for DASS-21 distributions is considered normal in a non-clinical population (Crawford & Henry, 2003). Harman's one-factor test indicated that common method bias was not a major problem among the study variables, with less than 50% of the total variance extracted by one factor (41.5%).

### Assumption Testing

The DASS-21 total and FFMQ-SF total distributions each had one univariate outlier. These values were Winsorised as recommended by Field (2018) to reduce bias in results. For the correlations, inspection of scatterplots indicated linear, homoscedastic associations between the three primary measures (loneliness, mindfulness, and psychological distress). All regression models met assumptions of sequential independence and lack of multicollinearity. Although the psychological distress variable was positively skewed, the residuals in all models were normal, linear, and homoscedastic. One multivariate outlier was identified and excluded, resulting in a final data set of 297 for all analyses.

### Descriptive Statistics

Mean scores for loneliness ( $M=46.36$ ,  $SD=10.43$ ), mindfulness ( $M=79.29$ ,  $SD=13.06$ ), and psychological distress ( $M=34.54$ ,  $SD=24.82$ ) were similar for males and females. Loneliness tended to decrease with older age and higher education and was greater for single people and those who lived alone. Mindfulness increased with older age and higher education, whilst in contrast, psychological distress decreased with older age and higher education. Most participants had normal range scores for Depression, Anxiety and Stress based on the DASS clinical cut-offs (Lovibond & Lovibond, 1995). However, 9.1%, 13.1% and 5.4% of participants had scores in the highest "Extremely Severe" category for Depression, Anxiety, and Stress respectively. Refer to Table 2 for the sample breakdown by DASS clinical groupings. The proportions of participants classified as having low, moderate, and high loneliness are also reported in Table 2, and were similar to those found by the Australian Psychological Society and Swinburne University (2018).

Table 3 includes means, standard deviations, actual ranges, and possible ranges for all scales and subscales, and bivariate correlations between variables. As presented in Table 4, the student and community subsamples did not differ on loneliness or psychological distress. However, the average mindfulness score in the student sample was lower compared to the community sample ( $g=-0.33$ ). To evaluate whether this group difference was likely to affect the mediation and moderation results, we re-ran all analyses using "Subsample Membership" as a covariate. The patterns of significant results did not change, so we opted to present the results of all analyses without the subsample covariate.

The bivariate correlations supported Hypotheses 1 to 3, by showing a large positive association between loneliness and psychological distress, a large negative association between loneliness and mindfulness, and a large negative association between mindfulness and psychological distress.

**Table 2** Sample breakdown according to cut-offs for depression, anxiety, stress, and loneliness

Scale	Normal	Mild	Moderate	Severe	Extremely Severe
Depression	168 (56.6%)	27 (9.1%)	55 (18.5%)	20 (6.7%)	27 (9.1%)
Anxiety	167 (56.2%)	23 (7.7%)	45 (15.2%)	23 (7.7%)	39 (13.1%)
Stress	157 (52.9%)	38 (12.8%)	44 (14.8%)	42 (14.1%)	16 (5.4%)
	Low		Moderate		High
Loneliness	95 (32.0%)		102 (34.3%)		100 (33.7%)

The following cut-offs from Lovibond and Lovibond (1995) were used. Depression: Normal=0–9, Mild=10–13, Moderate=14–20, Severe=21–27, and Extremely Severe=28+. Anxiety: Normal=0–7, Mild=8–9, Moderate=10–14, Severe=15–19, and Extremely Severe=20+. Stress: Normal=0–14, Mild=15–18, Moderate=19–25, Severe=26–33, and Extremely Severe=34+. For loneliness, the following cut-offs from Australian Psychological Society and Swinburne University (2018) were used: Low=20–40, Moderate=41–51, High=52–80

**Table 3** Correlation matrix for all scales, age, and gender including means, standard deviations, actual ranges, and possible ranges

Variable	1	2	3	4	5	6	7	8	9	10	11	12	13
1. Loneliness	–												
2. Non-Reactivity	-0.47***	–											
3. Observing	-0.28***	0.41***	–										
4. Awareness	-0.39***	0.42***	0.27***	–									
5. Describing	-0.48***	0.50***	0.34***	0.41***	–								
6. Non-Judging	-0.39***	0.41***	0.16***	0.46***	0.38***	–							
7. Trait Mindfulness	-0.57***	0.77***	0.58***	0.72***	0.75***	0.71***	–						
8. Depression	0.61***	-0.46***	-0.23***	-0.52***	-0.52***	-0.49***	-0.63***	–					
9. Anxiety	0.38***	-0.42***	-0.17***	-0.37***	-0.42***	-0.48***	-0.54***	0.63***	–				
10. Stress	0.47***	-0.50***	-0.28***	-0.54***	-0.42***	-0.53***	-0.65***	0.69***	0.66***	–			
11. Psychological Distress	0.56***	-0.53***	-0.26***	-0.54***	-0.52***	-0.57***	-0.69***	0.89***	0.85***	0.90***	–		
12. Age	-0.18**	0.30***	0.26***	0.24***	0.29***	0.28***	0.39***	-0.29***	-0.40***	-0.31***	-0.38***	–	
13. Gender <sup>1</sup>	0.02	-0.08	0.11	-0.08	-0.06	0.00	-0.03	0.01	0.02	0.02	0.02	0.13*	–
<i>M</i>	46.36	15.05	14.66	15.73	18.34	15.50	79.29	10.71	8.30	15.56	34.54	38.38	1.79
<i>SD</i>	10.43	3.70	3.20	3.54	3.75	4.29	13.06	10.02	8.42	9.90	24.82	11.31	0.40
Range Actual	23–73	6–24	5–20	7–25	9–25	5–25	48–113	0–42	0–36	0–42	0–112	18–75	1–2
Range Possible	20–80	5–25	4–20	5–25	5–25	5–25	24–120	0–42	0–42	0–42	0–126	18+	1–2

Two-tailed, Pearson's product moment bivariate correlations. <sup>1</sup> Gender coded as 1 = male, 2 = female, 1.5 = other

\*  $p < 0.05$ . \*\*  $p < 0.01$ . \*\*\*  $p < 0.001$



**Table 4** Means, standard deviations, and one-way analysis of variance in loneliness, mindfulness and psychological distress

Measure	Female		Male		F(1, 294)	p
	M	SE	M	SE		
Loneliness	46.43	0.68	45.93	1.39	0.11	0.740
Mindfulness	79.02	0.86	80.02	1.63	0.28	0.594
Psychological Distress	5.47	0.14	5.31	0.30	0.25	0.615

	Student		Community		F(1, 295)	p	g
	M	SE	M	SE			
Loneliness	46.92	0.70	44.63	1.22	2.67	0.104	
Mindfulness	78.24	0.84	82.53	1.63	6.06	0.014	-0.33
Psychological Distress	5.56	0.15	5.04	0.26	3.02	0.083	

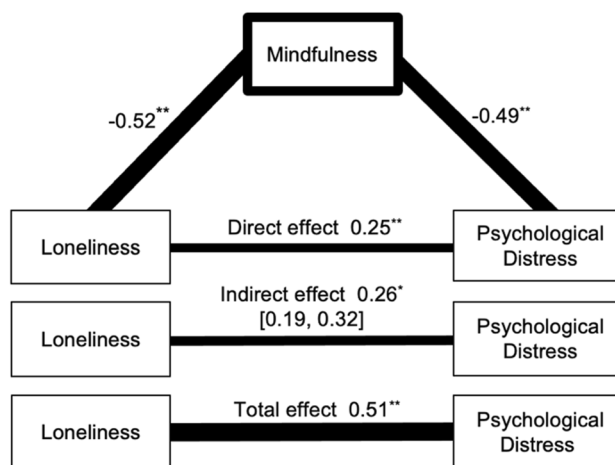
**Table 5** Mediation models: Unstandardized beta coefficients for the mediation by mindfulness in the loneliness-psychological distress association

Effect	b	SE	p	95% CI for b	
				LL	UL
<b>Mindfulness (FFMQ Total Score) – Final Step</b>					
Age	-0.31	0.10	0.001	-0.50	-0.12
Gender	0.99	2.48	0.69	-3.89	5.87
Loneliness	0.60	0.12	<0.001	0.37	0.83
Mindfulness	-0.94	0.10	<0.001	-1.13	-0.74
Indirect Effect	0.60	0.09		0.45	0.78
Total Effect	1.20	0.11	<0.001	0.99	1.42
<b>Mindfulness Facets (FFMQ Subscale Scores) – Final Step</b>					
Age	-0.33	0.09	<0.001	-0.51	-0.14
Gender	-0.32	2.45	0.90	-5.15	4.51
Loneliness	0.58	0.11	<0.001	0.36	0.81
Non-Reactivity	-0.90	0.34	0.009	-1.57	-0.23
Observing	0.33	0.34	0.341	-0.35	1.01
Awareness	-1.44	0.33	<0.001	-2.09	-0.79
Describing	-0.83	0.33	0.012	-1.47	-0.19
Non-Judging	-1.42	0.27	<0.001	-1.95	-0.88
<b>Indirect Effects</b>					
Non-Reactivity	0.14	0.06		0.03	0.25
Observing	-0.02	0.03		-0.08	0.03
Awareness	0.17	0.05		0.09	0.27
Describing	0.13	0.06		0.03	0.25
Non-Judging	0.20	0.06		0.10	0.32
Total Effect	1.20	0.11	<0.001	0.99	1.42

n=297. The confidence intervals for the indirect effects are based on 5,000 boot-strapped samples

**Simple Mediation Model**

Results of the simple mediation model are presented in Table 5 (unstandardized betas), Fig. 1 (standardized betas with lines weighted according to effect size), and Supplementary Figure S2 (proportion of standardized effects in the model). Loneliness, mindfulness, age, and gender accounted



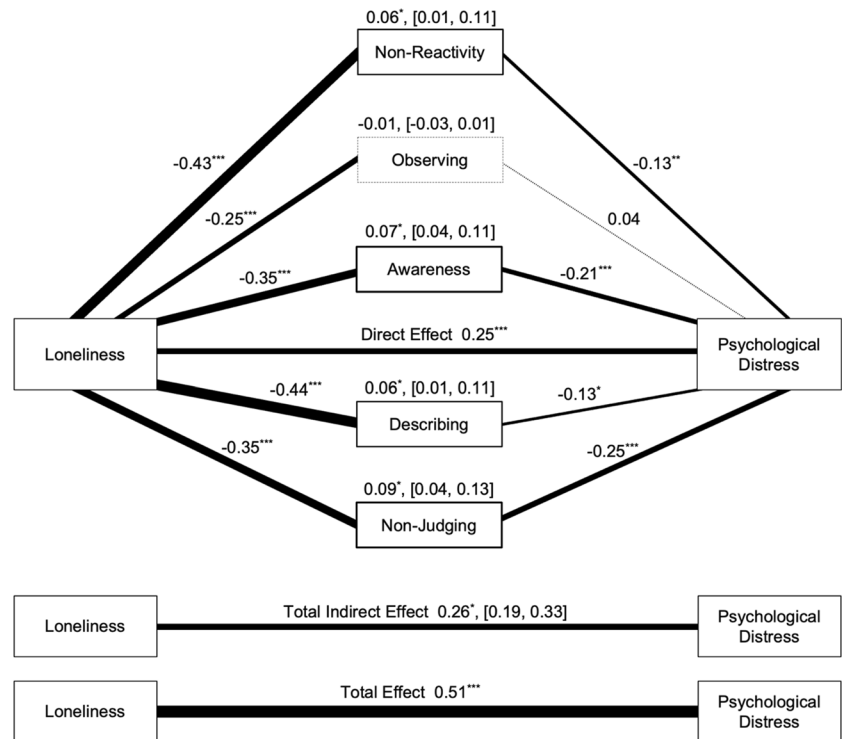
**Fig. 1** Simple mediation by trait mindfulness in the loneliness-psychological distress association. Note. Effect sizes are standardized beta weights. Indirect effect includes 95% confidence intervals in brackets. Path thicknesses and the mediator border are weighted according to effect size. The model controlled for age and gender. \* p < 0.01, \*\* p < 0.001

for significant variance in psychological distress, R<sup>2</sup> = 0.53, F(4, 292) = 83.86, p < 0.001. The total effect of loneliness on psychological distress was positive and significant. Supporting hypothesis four, the indirect effect via lower mindfulness was also significant, showing that loneliness was associated with low levels of mindfulness that, in turn, were associated with greater psychological distress. After controlling for the indirect effect, the direct effect of loneliness on psychological distress remained significant, indicating that mindfulness partially mediated the association.

**Multiple Mediation Model**

Table 5 (unstandardized betas), Fig. 2 (standardized betas with lines weighted according to effect size), and Supplementary Figure S2 (proportion of standardized effects in the model) report the results of the multiple mediation model.

**Fig. 2** Multiple mediation by the FFMQ mindfulness facets in the loneliness-psychological distress association. *Note.* Effect sizes are standardized beta weights. Indirect effects include 95% confidence intervals in brackets. Path thicknesses and mediator borders are weighted according to effect sizes. A dotted line denotes a non-significant effect. The model controlled for age and gender. \*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$



**Table 6** Moderation models: Unstandardized beta coefficients for the moderation of mindfulness in the loneliness-psychological distress association

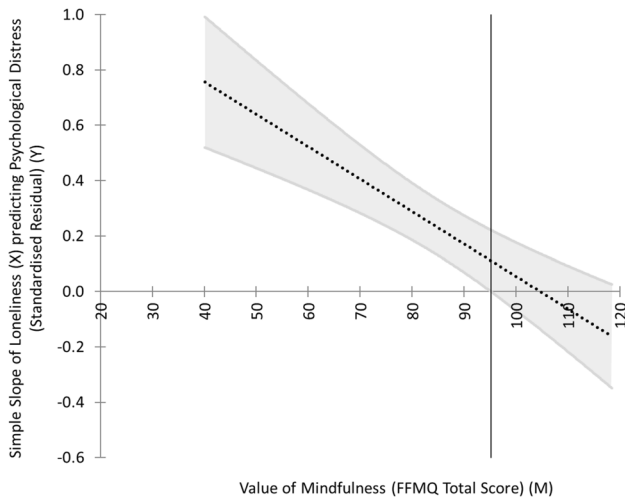
Effect	<i>b</i>	<i>SE</i>	$\beta$	<i>p</i>	95% CI for <i>b</i>	
					<i>LL</i>	<i>UL</i>
Mindfulness (FFMQ Total Score) – Final Step						
Age	-0.34	0.10	-0.15	< 0.001	-0.53	-0.15
Gender	0.86	2.44	0.01	0.73	-3.93	5.65
Loneliness	0.62	0.11	0.26	< 0.001	0.40	0.84
Mindfulness	-0.94	0.10	-0.49	< 0.001	-1.13	-0.74
Loneliness* <i>Mindfulness</i>	-0.03	0.01	-0.13	< 0.001	-0.04	-0.01
Mindfulness Facets (FFMQ Subscale Scores) – Final Step						
Age	-0.36	0.10	-0.16	–	-0.55	-0.16
Gender	-0.42	2.47	-0.01	–	-5.23	4.39
Loneliness	0.60	0.12	0.25	–	0.37	0.82
Non-Reactivity	-0.94	0.35	-0.14	–	-1.63	-0.25
Observing	0.34	0.33	0.04	–	-0.31	1.00
Awareness	-1.44	0.33	-0.20	–	-2.09	-0.80
Describing	-0.76	0.33	-0.12	–	-1.41	-0.12
Non-Judging	-1.43	0.30	-0.25	–	-2.02	-0.84
Loneliness* <i>Non-Reactivity</i>	-0.02	0.03	-0.03	–	-0.09	0.04
Loneliness* <i>Observing</i>	-0.02	0.03	-0.03	–	-0.08	0.04
Loneliness* <i>Awareness</i>	-0.03	0.03	-0.04	–	-0.09	0.03
Loneliness* <i>Describing</i>	-0.03	0.03	-0.04	–	-0.08	0.03
Loneliness* <i>Non –Judging</i>	-0.02	0.03	-0.04	–	-0.07	0.03

$n=297$ . Bootstrap means, standard errors, and bias-corrected confidence intervals based on 5,000 bootstrapped samples are reported for the mindfulness facets analysis. Standardized betas were calculated by rerunning the analyses using standardized variables

Together, loneliness, the FFMQ mindfulness facets, age, and gender explained significant unique variance in psychological distress,  $R^2 = 0.57$ ,  $F(8, 288) = 47.49$ ,  $p < 0.001$ . As predicted by hypothesis 5, the indirect pathways for Non-Judging, Awareness, and Non-Reactivity were positive and significant. The indirect pathway for Describing was also significant, while the Observing pathway was not. Thus, loneliness was associated with low levels of Non-Judging, Awareness, Non-Reactivity, and Describing that, in turn, were associated with greater psychological distress.

**Moderation Models**

The first moderated regression model presented in Table 6 assessed the prediction of psychological distress from loneliness, trait mindfulness (FFMQ total score), and their interaction, after controlling for age and gender. Together, the predictors explained a significant 55.4% of the variance in



**Fig. 3** Mindfulness moderates the loneliness-psychological distress association. *Note.* Johnson-Neyman plot showing a significant positive association between loneliness and psychological distress at FFMQ values below 95 and a non-significant association at values  $\geq 95$ . Distress scores are residuals after controlling for age and gender

psychological distress,  $F(5,291) = 72.15$ ,  $p < 0.001$ . As predicted by hypothesis 6, a positive main effect of loneliness on psychological distress was qualified by a significant interaction with mindfulness, which accounted for 1.9% of the variance in psychological distress ( $p < 0.001$ ). Consequently, we used PROCESS to probe the interaction. Johnson-Neyman significance regions indicated that loneliness was significantly associated with greater distress among participants who reported low or moderate FFMQ total scores, but it was non-significantly associated with distress for 14.1% of the sample who reported high levels of mindfulness with an FFMQ total score  $\geq 95$ ,  $t(291) = 1.36$ ,  $p = 0.18$ . The interaction is depicted in Fig. 3.

Table 6 also reports the results of a bootstrapped moderated regression analysis that simultaneously evaluated the five FFMQ mindfulness facets (Non-Reactivity, Observing, Awareness, Describing, and Non-Judging) as moderators. The model explained a significant 58.8% of the variance in psychological distress,  $F(13,283) = 31.03$ ,  $p < 0.001$ , with greater loneliness, and less Non-Reactivity, Awareness, Describing, and Non-Judging exhibiting significant associations with greater distress. In line with the FFMQ total score analysis, the interaction terms between loneliness and the five mindfulness facets together explained a significant 1.9% of the variance in psychological distress ( $p = 0.03$ ). However, individually, all mindfulness facet interactions were non-significantly associated with psychological distress when assessed with the other four mindfulness facets and their interactions.

**Supplementary Simple Mediation Model**

Table 7 presents results of the supplementary simple mediation model. Mindfulness, loneliness, age, and gender accounted for significant variance in psychological distress,  $R^2 = 0.73$ ,  $F(4, 292) = 83.86$ ,  $p < 0.001$ . The total effect of mindfulness on psychological distress was negative and significant. Supporting the supplementary hypothesis, the indirect effect via lower loneliness was significant. After controlling for the indirect effect, the direct effect of mindfulness on

**Table 7** Supplementary mediation model: Beta coefficients for the mediation by loneliness in the mindfulness-psychological distress association

Effect	<i>b</i>	<i>SE</i>	<i>p</i>	95% CI for <i>b</i>		<i>b</i> *
				<i>LL</i>	<i>UL</i>	
<b>Loneliness – Final Step</b>						
Age	−0.31	0.10	0.001	−0.50	−0.12	−0.14
Gender	0.99	2.48	0.69	−3.89	5.87	0.02
Mindfulness	−0.94	0.10	<0.001	−1.13	−0.74	−0.49
Loneliness	0.60	0.12	<0.001	0.37	0.83	0.25
Indirect Effect	−0.28	0.06		−0.40	−0.17	−0.15
Total Effect	−1.22	0.09	<0.001	−1.39	−1.05	−0.64

*n* = 297. The confidence intervals for the indirect effects are based on 5,000 boot-strapped samples

psychological distress remained significant and substantial, indicating that loneliness partially mediated the association.

## Discussion

Loneliness is an increasingly prolific problem that is associated with deleterious outcomes including elevated psychological distress. However, minimal research has examined the mechanisms of this association. The current study sought to determine whether trait mindfulness mediates or moderates the loneliness-psychological distress association in a sample of adults. As hypothesized, a simple mediation model found that trait mindfulness partially mediated the loneliness-psychological distress association, where high levels of loneliness were associated with low levels of mindfulness that, in turn, were associated with high levels of distress. In line with prediction, a multiple mediation analysis found that the indirect effect was driven by low levels of the FFMQ mindfulness facets of Non-Judging, Awareness, and Non-Reactivity. However, an unexpected indirect effect was observed through the Describing facet. A subsequent moderation model identified a hypothesized interaction between loneliness and trait mindfulness, where loneliness was associated with greater psychological distress among participants with low or moderate levels of trait mindfulness, but not among participants with high trait mindfulness. However, contrary to expectation, a second moderation model found that the five mindfulness facets did not individually moderate the association when examined as simultaneous moderators. A supplementary simple mediation analysis found that, as predicted, loneliness was a significant mediator in the trait mindfulness–psychological distress association.

In the simple mediation analysis, the positive pathway from loneliness to psychological distress indicates that participants who were experiencing greater loneliness also tended to experience elevated symptoms of psychological distress. Elevated distress is theorized to occur because loneliness promotes hyper-vigilant behavior, tendencies to view harmless people or situations as threatening, and social avoidance (Cacioppo et al., 2006a). This result converges with prior findings including longitudinal evidence that loneliness predicts psychological distress (Cacioppo et al., 2006b).

The negative pathway between loneliness and trait mindfulness aligns with findings that loneliness and trait mindfulness were negatively associated in adolescents (Clear et al., 2020) and young adults (Kingery et al., 2021). This negative association may occur because individuals with low levels of trait mindfulness are likely to respond to loneliness by engaging in cognitive processes that are conceptually incompatible with mindfulness, such as suppressing emotions and ruminating (Kingery et al.,

2021; Preece et al., 2021). In the opposing direction, the loneliness-mindfulness association may arise because loneliness involves attentional processes that consistently draw focus from the present moment, along with cognitive processes that are incompatible with mindfulness, such as rumination, emotion suppression, self-blame, and cognitive reactivity (Kingery et al., 2021; Preece et al., 2021; Raes et al., 2009). Additionally, Zimmer-Gembeck et al. (2021) found that mindfulness was associated with positive social coping responses which, in turn, were associated with less loneliness. When examining the pathways between loneliness and the mindfulness facets of Awareness, Non-Judging, Non-Reactivity, and Describing, the correlations were larger in our adult sample compared to those found by Zimmer-Gembeck et al. (2021) in their sample of adolescents.

The observed negative pathway between trait mindfulness and psychological distress suggests that participants with lower trait mindfulness tended to have more severe symptoms of psychological distress. Low mindfulness may elevate psychological distress by increasing cognitive reactivity, in which a low mood reactivates previous negative thinking patterns and emotions (Raes et al., 2009). Although this strong association aligns with prior findings, the correlation found in this study was substantially larger than the correlation in the meta-analysis by Carpenter et al. (2019). They quantified negative affective symptoms broadly, including symptoms from depression, various anxiety disorders, post-traumatic stress disorder, and obsessive–compulsive disorder. This suggests that trait mindfulness may have a stronger association with depression, anxiety, and stress than with symptoms of disorders such as post-traumatic stress disorder and obsessive–compulsive disorder.

Importantly, the simple mediation model revealed a significant positive indirect effect from loneliness to psychological distress through lower trait mindfulness. Over half of the total effect of loneliness on psychological distress was transmitted via trait mindfulness. The results suggest that participants who were experiencing loneliness tended to be less mindful, which, in turn, was associated with greater psychological distress. These findings complement prior evidence that rumination mediated the loneliness-depression association, in which a lack of present-moment attention and a repetitive focus on negative content exacerbated depression symptomatology (Zawadzki et al., 2013). Furthermore, our subsequent multiple mediation analysis found that the indirect effect from loneliness to psychological distress occurred via the mindfulness facets of Non-Judging, Awareness, Non-Reactivity, and Describing. The roles of Non-Judging, Awareness, and Non-Reactivity in the model complement prior findings that these three facets demonstrated the strongest associations with measures of psychological

distress (Kingery et al., 2020; Medvedev et al., 2018). Further, as Non-Judging, Awareness, and Non-Reactivity are qualities that underlie the state of equanimity, this supports the mediation findings from Mann and Walker (2022).

Our results suggest that the indirect pathway from loneliness to psychological distress via mindfulness may be driven by pathways through the facets of Non-Judging, Awareness, Non-Reactivity, and Describing. The mediating role of reduced Awareness may reflect its capacity to influence momentary experiences of happiness felt by lonely people. For example, Rowland et al. (2020) found that undergraduate participants with lower dispositional Awareness displayed impaired ability to carry over affective experiences from one moment to the next, and to switch between negative and positive affective states. Additionally, as theorized by Cacioppo et al., (2006a), the path via less Non-Judging may indicate that hypervigilance triggered by loneliness increases negative judgements, including viewing social situations as threatening, and expecting negative social outcomes (Hawley & Cacioppo, 2010). Further, the path via lower Non-Reactivity may reflect vulnerability inherent in the state of loneliness whereby emotional responses to the presenting situation are heightened through reactivation of prior negative thoughts and emotions (Raes et al., 2009). While the role of Describing in the model was not anticipated, it is possible that loneliness reduces the ability to understand, remedy and communicate about one's current emotional experience with others (Zimmaro et al., 2020). This combination of effects may then heighten experienced distress in the form of depression, anxiety, and stress symptoms.

The non-significant indirect effect of Observing aligns with prior evidence that it demonstrated weak and inconsistent associations with other constructs (Baer et al., 2006; Carpenter et al., 2019; Medvedev et al., 2018). As such, the finding that Observing did not mediate the association was expected. Overall, the significant effects in the model of Non-Judging, Awareness, Non-Reactivity, and Describing suggest that loneliness may reduce the tendency to maintain these trait mindfulness facets, which then leads to greater psychological distress.

While the mediation analyses found that tendencies to respond to loneliness with low levels of four facets of trait mindfulness were associated with greater psychological distress, our subsequent moderation analyses found that high trait mindfulness buffers the loneliness-psychological distress association. This suggests that a greater tendency to be mindful may protect individuals from more detrimental mental health outcomes when they are experiencing loneliness. The weaker association among participants with high trait mindfulness may be partially explained by the finding that high dispositional mindfulness weakened the association between total and uncontrollable rumination (Raes & Williams, 2010). When an individual experiences loneliness and

starts ruminating, high trait mindfulness may allow awareness of the pattern and encourage non-judgement toward the current situation. This may reduce emotional reactivity and allow greater control of the rumination, subsequently lowering the associated distress. In contrast, lower mindfulness may instead allow more destructive rumination cycles to proliferate and become uncontrollable, thus increasing the resulting distress. These moderation results align with previous findings that higher mindfulness was associated with less severe mental health outcomes in relation to high rejection sensitivity or acculturative stress (Liu et al., 2022; Yu et al., 2021).

More detailed analysis using the five trait mindfulness facets as simultaneous moderators indicated that together the five interactions were associated with psychological distress, but individually they were not. While it is possible that the low power for this analysis was unable to detect an existing effect, we consider this explanation unlikely due to the use of bootstrapping, and the model's ability to determine the significance of small effect sizes for other variables in the analysis. Additionally, while multi-collinearity could impact results, collinearity indices suggest this was not evident. Consequently, it seems most likely that the moderation effects of the five facets are cumulative, with all components working together to reduce the impacts of loneliness on psychological distress. The combined mediation and moderation findings suggest that trait mindfulness plays multiple roles in the loneliness-psychological distress association. High levels of trait mindfulness may buffer the effects of loneliness, and responding to loneliness with low levels of Non-Reactivity, Awareness, Describing, and Non-Judging may result in greater psychological distress.

The supplementary simple mediation model showed that higher trait mindfulness was associated with lower levels of loneliness which, in turn, were associated with lower psychological distress. However, the strength of the indirect effect was only 58.9% of that in the original proposed model. This mediation could align with the model proposed by Garland et al. (2015), in which mindfulness allows more flexible cognitive processes that increase the tendency to reappraise negative experiences and savor positive experiences, allowing for enhanced eudaimonic well-being. Further, this corresponds with findings that mindfulness interventions reduce both loneliness (Creswell et al., 2012) and psychological distress (Khouri et al., 2015). The primary purpose of this study was to examine mechanisms in the association between loneliness and psychological distress. However, the findings from the two simple mediation models suggest that the associations between the three constructs are complex and may be multi-directional.

The combined findings that four of the five facets of trait mindfulness mediate the loneliness-psychological distress association, and that high trait mindfulness buffers the impact

of loneliness on psychological distress provide a unique contribution to the existing psychological literature. Past research has established a strong positive association between loneliness and psychological distress (Cacioppo et al., 2006b; VanderWeele et al., 2011), with evidence demonstrating that mindfulness interventions have strong utility in promoting greater mental health outcomes (e.g., MBSR, MBCT; Frewen et al., 2008; Khoury et al., 2015; Piet & Hougaard, 2011) and reducing loneliness (Creswell et al., 2012; Zhang et al., 2018). Future research into mindfulness interventions for loneliness may benefit from examining the specific impacts of cultivating greater Awareness, Non-Judging, Non-Reactivity, and Describing to reduce subsequent psychological distress. It must be noted that the direct effect of loneliness on psychological distress was also significant and substantial. Consequently, research into new loneliness interventions may also benefit from targeting loneliness directly, possibly by including strategies to reduce maladaptive social cognition, to foster adaptive coping strategies, and increase positive social interaction and engagement (Williams et al., 2021). Additionally, due to the protective quality of high trait mindfulness in reducing mental health impacts stemming from loneliness and other adverse life experiences (Bergomi et al., 2013; Cole et al., 2014), mindfulness interventions should continue to be encouraged to increase well-being and foster resilience against adversity more broadly.

Due to COVID-19 restrictions, approaches to reduce loneliness that rely on in-person social connection have been far less accessible in recent times (Williams et al., 2021). Yet there is a great need for them at present, when much of the global population is experiencing extended periods of social isolation due to the pandemic (Williams et al., 2021). Additionally, many people are financially strained following ongoing implications of the pandemic response. Thus, loneliness interventions that are affordable, accessible remotely, and by large numbers of people could be of great benefit in reducing damaging mental health outcomes on a broad scale. Further, if the evolutionary theory by Cacioppo et al., (2006a) is correct, with loneliness leading to hypervigilance regarding potential social threats, this effect may be exacerbated by the additional risk of COVID-19 infection posed by social contact. Therefore, research into the development of targeted mindfulness interventions that aim to reduce psychological distress resulting from loneliness may be particularly pertinent.

## Limitations and Future Research

Several limitations of this study need to be acknowledged. Firstly, the cross-sectional design prevents causal inference. Therefore, the postulated direction of effects is based on underlying theory and previous research (Cacioppo et al., 2006a; Mann & Walker, 2022; Zawadzki et al., 2013) and

requires confirmation. Future studies could evaluate causation by conducting these mediation analyses with data from randomized controlled mindfulness interventions and analyzing results from baseline to post-intervention. Additionally, running the mediation analyses for the original and supplementary models using longitudinal data would better fit the hypothesized time sequence of these models. This would allow greater understanding of the complex interplay between the three constructs.

In respect to the role of Non-Judging in the model, the FFMQ scale captures judgmental processes in relation to the self and one's inner experience, with Medvedev et al. (2018) also finding that greater self-judgement related to higher scores on depression, anxiety, and stress. While we theorize that this judgmental attitude may also extend to external stimuli including people and situations, this would need to be tested using a broader measure of judgmental cognitive processes.

Although the sample represented adults aged 18 to 75, with a broad education range, most participants were females and students, which may limit generalizability of the results to other populations. However, average scores on the three primary measures did not differ as a function of gender, nor was gender a significant predictor (as a covariate) in the mediation or moderation models. Thus, the gender imbalance may have minimally impacted findings. Further, the large number of students in the sample compared to community members must be noted, along with the differing levels of mindfulness across the two samples. However, tests using the subsamples as a covariate indicated this did not influence findings in the models. That said, testing the current models in a general population sample with an even gender split may enhance generalizability. It should also be noted that the mean scores in this sample for all DASS-21 measures were notably higher than the Australian norms reported by Crawford et al. (2011). This may be due to the timing of data collection for this study, which was during the COVID-19 pandemic from April to July 2021. As such, it is possible that long-term social, economic, and health pressures led to greater psychological distress, while reducing participant ability to remain mindful over time, thus enhancing the negative association. To ensure these findings have not been influenced by COVID-19 isolation measures and pandemic-related stress, replication of this study when the pandemic has eased would be beneficial. Lastly, this research could be extended by conducting a mediation analysis that includes rumination as a parallel mediator to tease apart the roles of the two mechanisms.

**Supplementary Information** The online version contains supplementary material available at <https://doi.org/10.1007/s12671-023-02184-7>.

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**Author Contributions** Jahne R. Coutts-Smith: Conceptualization, Methodology, Material preparation, Data Collection, Statistical analyses, Writing—Original draft preparation, Subsequent drafts, Reviewing, and Editing. Wendy J. Phillips: Statistical analyses, Writing—Contributions to later drafts, Reviewing, and Editing. Both authors read and approved the final manuscript.

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**Data Availability** All study materials are available as open source materials via: [https://figshare.com/projects/The\\_Role\\_of\\_Trait\\_Mindfulness\\_in\\_the\\_Association\\_between\\_Loneliness\\_and\\_Psychological\\_Distress/138225](https://figshare.com/projects/The_Role_of_Trait_Mindfulness_in_the_Association_between_Loneliness_and_Psychological_Distress/138225)

## Declarations

**Ethics Statement** The Human Research Ethics Committee of the University of New England, Australia approved the study in accordance with the National Statement on Ethical Conduct in Human Research (2007) updated in 2018, which was developed by the National Health and Medical Research Council of Australia. The study was conducted in line with all requirements.

**Informed Consent** Informed consent was obtained from all individual participants included in the study.

**Conflict of Interest** The authors have no financial or non-financial interests to declare that are relevant to the content of this article.

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## References

- Andel, S. A., Shen, W., & Arvan, M. L. (2021). Depending on your own kindness: The moderating role of self-compassion on the within-person consequences of work loneliness during the COVID-19 pandemic. *Journal of Occupational Health Psychology, 26*(4), 276–290. <https://doi.org/10.1037/ocp0000271>
- Australian Psychological Society and Swinburne University. (2018). *Australian loneliness report: A survey exploring the loneliness levels of Australians and the impact on their health and wellbeing* [Report]. <https://apo.org.au/node/202286>. Accessed 6 Feb 2022
- Baer, R. A. (2011). Measuring mindfulness. *Contemporary Buddhism, 12*(1), 241–261. <https://doi.org/10.1080/14639947.2011.564842>
- Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13*(1), 27–45. <https://doi.org/10.1177/1073191105283504>
- Bergomi, C., Ströhle, G., Michalak, J., Funke, F., & Berking, M. (2013). Facing the dreaded: Does mindfulness facilitate coping with distressing experiences? A moderator analysis. *Cognitive Behaviour Therapy, 42*(1), 21–30. <https://doi.org/10.1080/16506073.2012.713391>
- Bishop, S. R. (2004). Mindfulness: A proposed operational definition. *Clinical Psychology: Science and Practice, 11*(3), 230–241. <https://doi.org/10.1093/clipsy.bph077>
- Bohlmeijer, E., ten Klooster, P. M., Fledderus, M., Veehof, M., & Baer, R. (2011). Psychometric properties of the Five Facet Mindfulness Questionnaire in depressed adults and development of a short form. *Assessment, 18*(3), 308–320. <https://doi.org/10.1177/1073191111408231>
- Brett, E. I., Espeleta, H. C., Lopez, S. V., Leavens, E. L. S., & Leffingwell, T. R. (2018). Mindfulness as a mediator of the association between adverse childhood experiences and alcohol use and consequences. *Addictive Behaviors, 84*, 92–98. <https://doi.org/10.1016/j.addbeh.2018.04.002>
- Cacioppo, J. T., Hawkley, L. C., Ernst, J. M., Burleson, M., Bertson, G. G., Nouriani, B., & Spiegel, D. (2006a). Loneliness within a nomological net: An evolutionary perspective. *Journal of Research in Personality, 40*(6), 1054–1085. <https://doi.org/10.1016/j.jrp.2005.11.007>
- Cacioppo, J. T., Hughes, M. E., Waite, L. J., Hawkley, L. C., & Thisted, R. A. (2006b). Loneliness as a specific risk factor for depressive symptoms: Cross-sectional and longitudinal analyses. *Psychology and Aging, 21*(1), 140–151. <https://doi.org/10.1037/0882-7974.21.1.140>
- Carpenter, J. K., Conroy, K., Gomez, A. F., Curren, L. C., & Hofmann, S. G. (2019). The relationship between trait mindfulness and affective symptoms: A meta-analysis of the Five Facet Mindfulness Questionnaire (FFMQ). *Clinical Psychology Review, 74*, 101785. <https://doi.org/10.1016/j.cpr.2019.101785>
- Cheng, S., Banks, K., Bartlett, B. A., San Miguel, G., & Vujanovic, A. A. (2018). Posttraumatic stress and mindfulness facets in relation to suicidal ideation severity among psychiatric inpatients. *Mindfulness, 9*(3), 761–772. <https://doi.org/10.1007/s12671-017-0814-y>
- Clear, S. J., Zimmer-Gembeck, M. J., Duffy, A. L., & Barber, B. L. (2020). Internalizing symptoms and loneliness: Direct effects of mindfulness and protection against the negative effects of peer victimization and exclusion. *International Journal of Behavioral Development, 44*(1), 51–61. <https://doi.org/10.1177/0165025419876358>
- Cohen, J., Cohen, P., West, S. G., & Aiken, L. S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd ed.). Lawrence Erlbaum Associates Publishers.
- Cole, N. N., Nonterah, C. W., Utsey, S. O., Hook, J. N., Hubbard, R. R., Opore-Henaku, A., & Fischer, N. L. (2014). Predictor and moderator effects of ego resilience and mindfulness on the relationship between academic stress and psychological well-being in a sample of Ghanaian college students. *Journal of Black Psychology, 41*(4), 340–357. <https://doi.org/10.1177/0095798414537939>
- Crawford, J. R., & Henry, J. D. (2003). The Depression Anxiety Stress Scales (DASS): Normative data and latent structure in a large non-clinical sample. *British Journal of Clinical Psychology, 42*, 111–131. <https://doi.org/10.1348/014466503321903544>
- Crawford, J., Cayley, C., Lovibond, P. F., Wilson, P. H., & Hartley, C. (2011). Percentile norms and accompanying interval estimates from an Australian general adult population sample for self-report mood scales (BAI, BDI, CRS-D, CES-D, DASS, DASS-21, STAI-X, STAI-Y, SRDS, and SRAS). *Australian Psychologist, 46*(1), 3–14. <https://doi.org/10.1111/j.1742-9544.2010.00003.x>
- Creswell, J. D., Irwin, M. R., Burkclund, L. J., Lieberman, M. D., Arevalo, J. M. G., Ma, J., Breen, E. C., & Cole, S. W. (2012). Mindfulness-based stress reduction training reduces loneliness and pro-inflammatory gene expression in older adults: A small

- randomized controlled trial. *Brain, Behavior, and Immunity*, 26(7), 1095–1101. <https://doi.org/10.1016/j.bbi.2012.07.006>
- Field, A. (2018). *Discovering statistics using IBM SPSS Statistics* (5th ed.). Sage.
- Frewen, P. A., Evans, E. M., Maraj, N., Dozois, D. J. A., & Partridge, K. (2008). Letting go: Mindfulness and negative automatic thinking. *Cognitive Therapy and Research*, 32, 758–774. <https://doi.org/10.1007/s10608-007-9142-1>
- Garland, E. L., Farb, N. A., Goldin, P. R., & Fredrickson, B. L. (2015). Mindfulness broadens awareness and builds eudaimonic meaning: A process model of mindful positive emotion regulation. *Psychological Inquiry*, 26(4), 293–314. <https://doi.org/10.1080/1047840X.2015.1064294>
- Hawkley, L. C., & Cacioppo, J. T. (2010). Loneliness matters: A theoretical and empirical review of consequences and mechanisms. *Annals of Behavioral Medicine*, 40(2), 218–227. <https://doi.org/10.1007/s12160-010-9210-8>
- Hayes, A. F. (2022). *Introduction to mediation, moderation, and conditional process analysis: A regression-based approach* (3rd ed.). The Guilford Press.
- Henry, J. D., & Crawford, J. R. (2005). The short-form version of the Depression Anxiety Stress Scales (DASS-21): Construct validity and normative data in a large non-clinical sample. *British Journal of Clinical Psychology*, 44(2), 227–239. <https://doi.org/10.1348/014466505X29657>
- Jeste, D. V., Lee, E. E., & Cacioppo, S. (2020). Battling the modern behavioral epidemic of loneliness: Suggestions for research and interventions. *JAMA Psychiatry*, 77(6), 553–554. <https://doi.org/10.1001/jamapsychiatry.2020.0027>
- Khoury, B., Sharma, M., Rush, S. E., & Fournier, C. (2015). Mindfulness-based stress reduction for healthy individuals: A meta-analysis. *Journal of Psychosomatic Research*, 78(6), 519–528. <https://doi.org/10.1016/j.jpsychores.2015.03.009>
- Kiken, L. G., Garland, E. L., Bluth, K., Palsson, O. S., & Gaylord, S. A. (2015). From a state to a trait: Trajectories of state mindfulness in meditation during intervention predict changes in trait mindfulness. *Personality and Individual Differences*, 81, 41–46. <https://doi.org/10.1016/j.paid.2014.12.044>
- Kingery, J. N., Bodenlos, J. S., & Lathrop, J. A. (2020). Facets of dispositional mindfulness versus sources of social support predicting college students' psychological adjustment. *Journal of American College Health*, 68(4), 403–410. <https://doi.org/10.1080/07448481.2019.1574801>
- Kingery, J. N., Bodenlos, J. S., Schneider, T. I., Peltz, J. S., & Sindoni, M. W. S. (2021). Dispositional mindfulness predicting psychological adjustment among college students: The role of rumination and gender. *Journal of American College Health*. <https://doi.org/10.1080/07448481.2021.1943411>
- Ling, R., Kelly, B., Considine, R., Tynan, R., Searles, A., & Doran, C. M. (2016). The economic impact of psychological distress in the Australian coal mining industry. *Journal of Occupational and Environmental Medicine*, 58(5), e171–e176. <https://doi.org/10.1097/JOM.0000000000000714>
- Liu, S., He, L., Wei, M., Du, Y., & Cheng, D. (2022). Depression and anxiety from acculturative stress: Maladaptive perfectionism as a mediator and mindfulness as a moderator. *Asian American Journal of Psychology*, 13(2), 207–216. <https://doi.org/10.1037/aap0000242>
- Lovibond, S. H., & Lovibond, P. F. (1995). *Manual for the depression anxiety stress scales* (2nd ed.). Psychology Foundation.
- Mahon, N. E., Yarcheski, A., Yarcheski, T. J., Cannella, B. L., & Hanks, M. M. (2006). A meta-analytic study of predictors for loneliness during adolescence. *Nursing Research*, 55(5), 308–315. <https://doi.org/10.1097/00006199-200609000-00003>
- Mäkineniemi, J.-P., Oksanen, A., & Mäkikangas, A. (2021). Loneliness and well-being during the COVID-19 pandemic: The moderating roles of personal, social and organizational resources on perceived stress and exhaustion among Finnish university employees. *International Journal of Environmental Research and Public Health*, 18(13), 7146. <https://doi.org/10.3390/ijerph18137146>
- Mann, L. M., & Walker, B. R. (2022). The role of equanimity in mediating the relationship between psychological distress and social isolation during COVID-19. *Journal of Affective Disorders*, 296, 370–379. <https://doi.org/10.1016/j.jad.2021.09.087>
- McLachlan, K. J. J., & Gale, C. R. (2018). The effects of psychological distress and its interaction with socioeconomic position on risk of developing four chronic diseases. *Journal of Psychosomatic Research*, 109, 79–85. <https://doi.org/10.1016/j.jpsychores.2018.04.004>
- Medvedev, O. N., Norden, P. A., Krägeloh, C. U., & Siebert, R. J. (2018). Investigating unique contributions of dispositional mindfulness facets to depression, anxiety, and stress in general and student populations. *Mindfulness*, 9(6), 1757–1767. <https://doi.org/10.1007/s12671-018-0917-0>
- Morrison, R., & O'Connor, R. C. (2008). The role of rumination, attentional biases and stress in psychological distress. *British Journal of Psychology*, 99(2), 191–209. <https://doi.org/10.1348/000712607X216080>
- Newby, J. M., O'Moore, K., Tang, S., Christensen, H., & Faasse, K. (2020). Acute mental health responses during the COVID-19 pandemic in Australia. *PLoS ONE*, 15(7), e0236562. <https://doi.org/10.1371/journal.pone.0236562>
- Nolen-Hoeksema, S., & Ahrens, C. (2002). Age differences and similarities in the correlates of depressive symptoms. *Psychology and Aging*, 17(1), 116–124. <https://doi.org/10.1037/0882-7974.17.1.116>
- O'Sullivan, R., Burns, A., Leavey, G., Leroi, I., Burholt, V., Lubben, J., Holt-Lunstad, J., Victor, C., Lawlor, B., Vilar-Compte, M., Perissinotto, C. M., Tully, M. A., Sullivan, M. P., Rosato, M., Power, J. M., Tiilikainen, E., & Prohaska, T. R. (2021). Impact of the COVID-19 pandemic on loneliness and social isolation: A multi-country study. *International Journal of Environmental Research and Public Health*, 18(19), 9982. <https://doi.org/10.3390/ijerph18199982>
- Piet, J., & Hougaard, E. (2011). The effect of mindfulness-based cognitive therapy for prevention of relapse in recurrent major depressive disorder: A systematic review and meta-analysis. *Clinical Psychology Review*, 31(6), 1032–1040. <https://doi.org/10.1016/j.cpr.2011.05.002>
- Preacher, K. J., & Hayes, A. F. (2008). Asymptotic and resampling strategies for assessing and comparing indirect effects in multiple mediator models. *Behavior Research Methods*, 40(3), 879–891. <https://doi.org/10.3758/BRM.40.3.879>
- Preece, D. A., Goldenberg, A., Becerra, R., Boyes, M., Hasking, P., & Gross, J. J. (2021). Loneliness and emotion regulation. *Personality and Individual Differences*, 180, 110974. <https://doi.org/10.1016/j.paid.2021.110974>
- Raes, F., & Williams, J. M. G. (2010). The relationship between mindfulness and uncontrollability of ruminative thinking. *Mindfulness*, 1(4), 199–203. <https://doi.org/10.1007/s12671-010-0021-6>
- Raes, F., Dewulf, D., Van Heeringen, C., & Williams, J. M. G. (2009). Mindfulness and reduced cognitive reactivity to sad mood: Evidence from a correlational study and a non-randomized waiting list controlled study. *Behaviour Research and Therapy*, 47(7), 623–627. <https://doi.org/10.1016/j.brat.2009.03.007>
- Rowland, Z., Wenzel, M., & Kubiak, T. (2020). A mind full of happiness: How mindfulness shapes affect dynamics in daily life. *Emotion*, 20(3), 436–451. <https://doi.org/10.1037/emo0000562>
- Russ, T. C., Stamatakis, E., Hamer, M., Starr, J. M., Kivimäki, M., & Batty, G. D. (2012). Association between psychological distress and mortality: Individual participant pooled analysis of 10



- prospective cohort studies. *BMJ*, 345, e4933. <https://doi.org/10.1136/bmj.e4933>
- Russell, D. W. (1996). UCLA loneliness scale (Version 3): reliability, validity, and factor structure. *Journal of Personality Assessment*, 66(1), 20–40. [https://doi.org/10.1207/s15327752jpa6601\\_2](https://doi.org/10.1207/s15327752jpa6601_2)
- Son, H., Cho, H. J., Cho, S., Ryu, J., & Kim, S. (2022). The moderating effect of social support between loneliness and depression: Differences between the young-old and the old-old. *International Journal of Environmental Research and Public Health*, 19(4), 2322. <https://doi.org/10.3390/ijerph19042322>
- Stanley, I. H., Boffa, J. W., Tran, J. K., Schmidt, N. B., Joiner, T. E., & Vujanovic, A. A. (2019). Posttraumatic stress disorder symptoms and mindfulness facets in relation to suicide risk among firefighters. *Journal of Clinical Psychology*, 75(4), 696–709. <https://doi.org/10.1002/jclp.22748>
- VanderWeele, T. J., Hawkey, L. C., Thisted, R. A., & Cacioppo, J. T. (2011). A marginal structural model analysis for loneliness: Implications for intervention trials and clinical practice. *Journal of Consulting and Clinical Psychology*, 79(2), 225–235. <https://doi.org/10.1037/a0022610>
- Vanhalst, J., Luyckx, K., Raes, F., & Goossens, L. (2012). Loneliness and depressive symptoms: The mediating and moderating role of uncontrollable ruminative thoughts. *The Journal of Psychology*, 146(1–2), 259–276. <https://doi.org/10.1080/00223980.2011.555433>
- Williams, C. Y. K., Townson, A. T., Kapur, M., Ferreira, A. F., Nunn, R., Galante, J., Phillips, V., Gentry, S., & Usher-Smith, J. A. (2021). Interventions to reduce social isolation and loneliness during COVID-19 physical distancing measures: A rapid systematic review. *PLoS ONE*, 16(2), e0247139. <https://doi.org/10.1371/journal.pone.0247139>
- Wilson, J. M., Weiss, A., & Shook, N. J. (2020). Mindfulness, self-compassion, and savoring: Factors that explain the relation between perceived social support and well-being. *Personality and Individual Differences*, 152, 109568. <https://doi.org/10.1016/j.paid.2019.109568>
- Yu, S., Shi, J., Huang, J., Fan, S., & Xu, W. (2021). Longitudinal relationship between emotional insecurity and adolescent mental health: The mediation of rejection sensitivity and moderation of dispositional mindfulness. *Mindfulness*, 12(11), 2662–2671. <https://doi.org/10.1007/s12671-021-01727-0>
- Zawadzki, M. J., Graham, J. E., & Gerin, W. (2013). Rumination and anxiety mediate the effect of loneliness on depressed mood and sleep quality in college students. *Health Psychology*, 32(2), 212–222. <https://doi.org/10.1037/a0029007>
- Zhang, N., Fan, F., Huang, S., & Rodriguez, M. A. (2018). Mindfulness training for loneliness among Chinese college students: A pilot randomized controlled trial. *International Journal of Psychology*, 53(5), 373–378. <https://doi.org/10.1002/ijop.12394>
- Zimmaro, L. A., Carson, J. W., Olsen, M. K., Sanders, L. L., Keefe, F. J., & Porter, L. S. (2020). Greater mindfulness associated with lower pain, fatigue, and psychological distress in women with metastatic breast cancer. *Psycho-Oncology*, 29(2), 263–270. <https://doi.org/10.1002/pon.5223>
- Zimmer-Gembeck, M. J., Clear, S. J., & Campbell, S. M. (2021). Peer relationships and stress: Indirect associations of dispositional mindfulness with depression, anxiety and loneliness via ways of coping. *Journal of Adolescence*, 93(1), 177–189. <https://doi.org/10.1016/j.adolescence.2021.11.003>

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