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Sleep disturbance mediates the link between both self-compassion and self-criticism and psychological distress during prolonged periods of stress

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Abstract

Poor sleep and subsequent decline in mental health often occur during times of prolonged stress, such as a pandemic. Self-compassion is linked with improved sleep and better mental health, while self-criticism is linked with poorer sleep and psychological distress. Given there is little evidence of the interrelationships of these constructs, we examined whether higher self-compassion or lower levels of self-criticism can reduce psychological distress directly and indirectly via sleep during times of prolonged stress. Structural equation modelling was used to analyse two samples ($N = 722$, Study 1, and $N = 622$, Replication Study) of university students during different stages of the pandemic. An aggregate psychological distress construct was calculated using depression, anxiety and stress measures. We created models that showed insomnia symptoms mediated the relationship between self-compassion/self-criticism and psychological distress. Sleep partially mediated both relationships, and this was the strongest effect in both samples. This suggests that improving self-compassion and reducing self-criticism will

improve sleep, leading to reduced psychological distress. As our findings are robust and held at two time points, future research should investigate broader demographics and differing stress responses.

KEYWORDS

insomnia, psychological distress, self-compassion, self-criticism, wellbeing

INTRODUCTION

Traumatic and stressful events, such as global pandemics, profoundly impact an individual's psychological well-being, mental health and capacity to function in daily life (Boden et al., 2021). Common adverse outcomes during, and following, stressful events include psychological distress such as higher levels of acute and posttraumatic stress (Copuroglu et al., 2010), depression (Kessler, 1997) and anxiety (Blazer et al., 1987). Psychological distress is further exacerbated during periods of prolonged stress, which is defined as the repeated or chronic exposure to a stressful situation (Vigil et al., 2022). The stay-at-home lockdowns of the COVID-19 pandemic are one recent example of prolonged stress, as explained by the negative impact they had on mental health, globally (Nicholson et al., 2023; Onyeaka et al., 2021). These findings are important considering the impact that prolonged stress can have on long-term health (e.g. impairments in memory or dysregulated stress hormone secretion; Noushad et al., 2021). Given the considerable negative impact of poor mental health on an individual's life, understanding the psychological mechanisms and malleable contributing factors to these outcomes may assist the development of targeted and evidence-based interventions. Research has suggested that insomnia symptoms are one such factor that can exacerbate psychological distress (Scott et al., 2021).

The role of insomnia symptoms in understanding psychological distress

The most prevalent form of sleep disturbance is insomnia, defined as dissatisfaction with sleep quantity or quality and difficulty falling or staying asleep (APA, 2022). Approximately one quarter to one third of the population experience at least one symptom of insomnia (Morin et al., 2021). Insomnia symptoms have been demonstrated to predict psychological distress such as depression and anxiety (Dickinson et al., 2018). Insomnia symptoms include delayed sleep onset, frequent nighttime awakenings, waking earlier than expected, waking tired, disrupted sleep, daytime drowsiness or napping, and nightmares (Alimoradi et al., 2021; Coren, 1994).

Additionally, insomnia symptoms have been consistently found to increase during stress (van Reeth et al., 2000). This increase in stress is due to worry (negatively valenced repetitive thoughts concerned with the future; Pillai & Drake, 2015) and rumination (negatively valenced repetitive thoughts concerned with the past; Pillai & Drake, 2015). Worry and rumination can increase cognitive and physiological arousal, inhibiting one's sleep ability and impairing sleep quality (Pillai & Drake, 2015).

Research has demonstrated a bi-directional relationship between sleep and mental health (Bartlett & Jackson, 2016). That said, insomnia symptoms have been argued to be a prodromal

feature of psychological distress (Reynolds & O'Hara, 2013). Given this, identifying and implementing strategies that can improve insomnia symptoms could be a valuable form of early intervention to circumvent psychological distress developing (Reynolds & O'Hara, 2013).

Self-compassion and self-criticism

Self-compassion refers to a positive, supportive and non-judgemental relationship with oneself and is particularly important in times of stress (Gilbert, 2014). Cultivating self-compassion activates the self-soothing emotion regulation system, triggering feelings of safeness and contentment, thereby protecting against physiological and cognitive arousal (Gilbert, 2014). Activation of the self-soothing system is vital to counterbalance the threat and drive motivational systems, promoting rest and restoration (Gilbert, 2014). Given the self-soothing system is a core component of the process of preparing for rest and sleep, self-compassion is argued to be a protective factor against insomnia symptoms (Kim et al., 2021). This idea was supported by a recent meta-analysis that found a small, positive, significant relationship between self-compassion and sleep quality (Brown et al., 2021). Further, self-compassion was shown to consistently buffer psychological distress across multiple countries during the COVID-19 lockdowns (Gutiérrez-Hernández et al., 2021; Lau et al., 2020). This point is important as during times of stress, individuals are more susceptible to an underactive self-soothing system and a hyperactive threat system (Gilbert, 2014). As a result, stress often triggers self-criticism, referring to a harsh and condemning style of responding to one's own inadequacies or errors. To understand one's style of self-relating, it is important to consider both self-compassion and self-criticism.

Self-criticism has been argued to heighten difficulties with sleep through increased restlessness and rumination (Butz & Stahlberg, 2018). Engaging in ruminative self-critical thoughts is not conducive to restful sleep, as they trigger the body's threat system, resulting in higher cortisol, muscle tension and anxiety. Brown et al.'s (2021) meta-analysis found self-criticism had a moderate, negative, significant relationship with sleep quality, while Rakhimov et al. (2022) suggested that participants with lower levels of self-compassion were more likely to develop insomnia symptoms. Based on these findings, Brown et al. (2021) posited that self-compassion-based therapies, such as Compassion Focused Therapy (CFT; Gilbert, 2014), can be beneficial in addressing insomnia symptoms.

Self-compassion has a beneficial effect on mental health, with a meta-analysis finding a large relationship between higher levels of self-compassion and lower levels of stress, depression and anxiety (MacBeth & Gumley, 2012). Research has demonstrated that increasing self-compassion through CFT decreases rumination, depression, anxiety and stress (Frostadottir & Dorjee, 2019). Similarly, higher levels of self-criticism are associated with increased psychological distress (McIntyre et al., 2018). These findings suggest that interventions targeting self-compassion and self-criticism could have a dual benefit of improving both mental health and sleep.

The interrelationships of self-compassion, self-criticism, sleep and mental health

To date, a significant amount of research has investigated the bivariate relationships between the pairings of self-compassion/criticism and psychological distress (Löw et al., 2020), self-compassion/criticism and sleep (Bar et al., 2020; Brown et al., 2021) and sleep and psychological

distress (Alvaro et al., 2013; Scott et al., 2021). It is acknowledged that, for each pairing, the causal direction of the relationships is unknown and most likely bi-directional (Alvaro et al., 2013; Brown et al., 2021). Given the interrelationships between these factors, a recent cross-sectional mediation study by Kim et al. (2021) proposed a pathway through which poor sleep quality negatively impacts one's level of self-compassion and, in turn, self-compassion impacts mental health. They found that self-compassion and self-criticism were significant mediators of the relationship between sleep and mental health, with self-criticism being the stronger mediator, resulting in a full mediation effect (Kim et al., 2021).

We acknowledge the interrelationships relationships between self-compassion/criticism, sleep and mental health outcomes. The causal mechanism between these factors has not been determined, despite researchers largely agreeing that these are likely to be bi-directional (Alvaro et al., 2013; Brown et al., 2021). Noting this however, examining potential 'causal' pathways can be useful to elucidate potential avenues for therapeutic intervention. Although we acknowledge the work of Kim et al. (2021), arguably, it would yield greater clinical utility if self-compassion/criticism was the predictor in a mediation model (as opposed to sleep), as this can be the target of CFT to improve both sleep and mental health outcomes (defined as a lacking presence of psychological distress, thereby indicating good mental health). Furthermore, comorbid insomnia symptoms and psychological distress are theorised to be the norm, not the exception (Harvey, 2022). If sleep is a mediator of the relationship between self-compassion/criticism and mental health outcomes, there could be an additional benefit of therapy in terms of improvement in mental health via improvement in sleep. Investigating these relationships during times of prolonged stress, such as during the pandemic, is important, as it is under those circumstances that individuals are more likely to experience lower levels of self-compassion, higher levels of self-criticism, more insomnia symptoms and increased psychological distress (Cheli et al., 2020). We believe these variables are of particular interest given the transdiagnostic nature of self-compassion, self-criticism, stress and insomnia symptoms (Harvey & Buysse, 2017). Finally, understanding the role of sleep in predicting mental health outcomes will better direct future efforts to develop evidence-based psychological interventions during these times of prolonged stress.

Rationale and aim

The current study aims to assess whether sleep mediates the relationship between self-compassion and self-criticism, and psychological distress (depression, anxiety and stress) in two large cross-sectional samples. We acknowledge the limitations with determining causation in cross-sectional models; however, in line with recommendations from Maxwell and Cole (2007), we proceeded with the cross-sectional mediation to examine the evidence of these relationships to determine potential merit for longitudinal research in this space. In order to provide greater confidence in the robustness of our finding, our analysis was repeated in both samples. The data from the two samples were collected during a period of prolonged stress, with the first collected in June 2020 (during the first Australian COVID-19 lockdown, in which there were national stay-at-home orders) and the second collected in October 2021 (during the second Australian COVID-19 lockdown in which most states were given stay-at-home orders). It was hypothesised that, in both samples:

1. A partial mediation would occur whereby higher self-compassion and lower self-criticism would directly predict better mental health.

2. There would be an indirect effect whereby higher self-compassion and lower self-criticism would predict better sleep, which would, in turn, predict better mental health.

METHOD

Research design

Two cross-sectional survey studies were completed 16 months apart on independent samples. Study 1 was completed during Australia's first lockdown in May to June 2020, and Replication Study was conducted in October 2021, in which most of the population were in lockdown. Both were a part of a more extensive study, and only the relevant measures are presented here. The studies were approved by the Australian Catholic University (ACU) Human Research Ethics Committee (2020-110E; 2021-193E).

Participants

For both studies, participants were enrolled at ACU in either undergraduate or postgraduate study at one of the campuses in Victoria, New South Wales, Queensland and the Australian Capital Territory. Emails were sent out from student's course coordinators at ACU and invited to participate in the studies at their respective timepoints. This was predominantly done in the Faculty of Health Sciences. There was no requirement for participants to have either completed or not completed Study 1. Participants created a unique code, which was used to be matched over studies. However, there less than 10% of participants could be matched, therefore inhibiting a longitudinal analysis to be conducted. Participants were presented with an information form through Qualtrics and needed to consent to complete the study. If they failed to consent, the study was terminated. Participants were also informed that they could withdraw their consent at any time. Participants received either course credit or were entered into a draw for $20 AUD gift vouchers for participation. Study 1 had a total of 722 students that completed the study. Ages ranged from 17 to 56 ($M = 22.77$, $SD = 6.63$), and 83.5% were women. Replication Study consisted of 622 students that completed the study. Ages ranged from 17 to 71 ($M = 23.53$, $SD = 7.37$), with 82.5% identifying as women.

Measures

Demographic questions

Participants completed a series of demographic questions, such as age, gender, education level, living arrangements and weekly hours worked.

Self-Compassion Scale–Short Form

The Self-Compassion Scale–Short Form (SCS-SF) is a 12-item self-report questionnaire designed to measure self-compassion (Raes et al., 2011). The two subscale scoring method (self-

compassion and self-criticism) was used as a more valid and informative alternative to the total score (Brenner et al., 2017; Ferrari et al., 2022). Participants rate each item on a 5-point Likert scale from 1 (*Almost never*) to 5 (*Almost always*). Subscale scores are computed by calculating the mean of subscale item responses. Higher scores on the self-compassion subscale indicate higher levels of self-compassion (e.g. 'I try to be understanding and patient towards those aspects of my personality I don't like'). The negative subscale items are reversed scored. The mean of each subscale is then computed to provide a total self-criticism mean, meaning higher scores on this test indicate lower self-criticism (e.g. 'I'm disapproving and judgmental about my own flaws and inadequacies'). This study found acceptable internal consistency for the self-compassion subscale ($\alpha = .79$ Study 1; $\alpha = .80$ Replication Study) and high internal consistency for the self-criticism subscale ($\alpha = .86$ Study 1; $\alpha = .86$ Replication Study).

Insomnia Severity Index

The Insomnia Severity Index (ISI, Bastien et al., 2001) is a seven-item measure covering the nighttime and daytime components of insomnia (Coren, 1994). Participants rate each item on a 5-point Likert scale covering areas such as falling asleep, staying asleep and perceiving how much their sleep problem interferes with daily functioning. The scores for all seven items are added, with the total score indicative of different thresholds for insomnia (e.g. 'subthreshold insomnia' and 'clinical insomnia [severe]'), for example, 0 (*Not at all interfering*) to 4 (*very much interfering*). Higher scores on the ISI indicate a greater likelihood of insomnia. This study demonstrated high internal consistency ($\alpha = .88$ Study 1, $\alpha = .88$ Replication Study).

Depression Anxiety Stress Scale 21-Item

The Depression Anxiety Stress Scale 21-Item (DASS-21, Antony et al., 1998) is a 21-item scale that independently measures three negative emotional states: depression, anxiety and stress (Henry & Crawford, 2005). Participants respond on a 4-point Likert scale ranging from 0 (*did not apply to me at all*) to 3 (*applied to me very much or most of the time*). Scores are summed for each scale, and the total for each scale was multiplied by two. Higher scores indicate greater levels of each respective subscale. Example items include 'I felt that life was meaningless' (depression), 'I felt scared without any good reason' (anxiety) and 'I found it hard to wind down' (stress). One item of the anxiety subscale was missing ('I was aware of dryness of my mouth') in Study 1 due to human error, so an imputation of this item was calculated using the median score on the six anxiety items measured. This study found that the internal consistency was found to be high for all of the DASS subscales for both studies (including the anxiety subscale for study one with the imputed item) with Cronbach's $\alpha > .84$.

Procedure

The procedure was identical for both studies. Participants completed a 30-min questionnaire online via Qualtrics in their own time. Once consent was obtained, each participant completed a series of demographic and COVID-19-related questions. Participants then completed the

scales (i.e. SCS-SF, ISI and DASS-21) presented in a randomised order. Participants went into the draw to win a $20 AUD voucher for their participation.

Statistical analysis plan

All analyses were conducted using IBM SPSS Statistics Version 27 and jamovi 2.3.13 software (The jamovi project, 2021). An examination of missing data found <5% to be missing, concluding that data were missing completely at random (Schafer, 1999). For the purpose of running the analysis, cases were deleted listwise. No outliers were found, and normality was found to be met. Bivariate correlations were conducted to assess linear relationships. G*Power (Faul et al., 2009) was used with power set at .8 with an alpha of .05 with a small effect size of 0.1 with two predictors, which provided a recommended sample size of 614. This power estimate was very conservative, given the prior relationships between self-compassion, self-criticism, insomnia symptoms and psychological distress, and we expected the relationships to be larger than that given. However, in being conservative, we are confident that we have sufficient power to find the results.

Structural equation modelling (SEM) was used to analyse whether sleep mediated the relationship between self-compassion or self-criticism and psychological distress. The variables of depression, anxiety and stress were loaded onto the psychological distress construct where higher scores indicate higher symptoms of psychological distress. For each study, two models were run, one with self-compassion and one with self-criticism as the predictor. Goodness of fit was determined for the Normed Fit Index (NFI; Bentler & Bonett, 1980) as above .90, the Comparative Fit Index (CFI; Bentler, 1990) as above .95 and for the Root-Mean-Square Error of Approximation (RMSEA; Browne & Cudeck, 1992) as below .05 for close fit, values around .08 indicated reasonable fit, and values above .10 indicated poor fit. Finally, chi-square difference tests were used to compare model fit between nested models. Chi-square assumptions are designed to be non-significant; however, we expect some to be significant due to the large sample size in both studies (Teo, 2013).

RESULTS

Descriptive statistics

Descriptive statistics for the self-compassion, insomnia symptoms and psychological distress construct scales for Study 1 and Replication Study are displayed in Table 1. Due to the noteworthy sex imbalance in our samples, independent samples *t*-tests were run for each variable to assess if sex was a confounding variable. No significant differences were found in either study for any variable (all $p \geq .175$), so it was not controlled for in the subsequent analysis. Results of the *t*-tests are presented in Table 1.

Correlations

The results of Pearson's correlations for the psychological variables for both studies can be found in Table 2. Across the board, all correlations were significant at the $p < .001$ level. Similar

TABLE 1 Descriptive statistics for self-compassion, sleep disturbance and mental health construct variables divided by gender, with *t*-test comparisons between males and females.

	Study 1			Replication Study		
Scale	Females M (SD)	Males M (SD)	*t*-statistic (Cohen's d)	Females M (SD)	Males M (SD)	*t*-statistic (Cohen's d)
SCS-SF self-compassion subscale	3.10 (.75)	3.34 (.76)	3.01 (.32)	3.17 (.77)	3.14 (.79)	−.29 (−.03)
SCS-SF self-criticism subscale	2.45 (.90)	2.66 (.89)	2.24 (.24)	2.48 (.89)	2.63 (.92)	1.63 (.18)
Insomnia Severity Index	12.07 (6.79)	11.42 (6.41)	−.91 (−.01)	12.35 (6.72)	11.48 (7.41)	−1.18 (−.13)
DASS depression subscale	14.43 (11.73)	14.80 (12.15)	.28 (.03)	18.91 (10.98)	17.12 (11.53)	−1.48 (−.16)
DASS anxiety subscale	11.76 (11.11)	9.84 (10.27)	−1.63 (−.17)	14.50 (11.18)	13.64 (11.95)	−.70 (−.08)
DASS stress subscale	20.80 (10.35)	18.72 (10.85)	−1.87 (−.20)	16.67 (9.47)	15.94 (10.29)	−.70 (−.08)

Note: All of the *t*-tests were non-significant.
Abbreviations: DASS, Depression Anxiety and Stress Scale; SCS-SF, Self-Compassion Scale–Short Form.

effect sizes and directions for the relationships were observed in both Study 1 and Replication Study. A weak correlation is classified as .10–.29, a moderate correlation is .30–.49 and large correlation is ≥.50 (Cohen, 1988). Self-compassion had a negative, weak correlation with anxiety and a negative, moderate correlation with insomnia, depression and stress. Self-compassion had weak-to-moderate, positive correlations with self-criticism and weak-to-moderate, negative correlations with the remaining variables. The same relationships were found between self-criticism and the remaining variables. Insomnia had a positive, moderate correlation with depression and a positive, strong correlation with anxiety and stress.

Self-compassion Study 1

Fit was tested for a model examining the relationship between self-compassion and mental health via insomnia symptoms. The model and beta coefficients are presented in Figure 1. The findings of the mediation demonstrated a partial mediation effect that accounted for a large proportion of the variance in psychological distress ($R^2 = .45$, total effect = −4.79). A significant direct effect was found between self-compassion and psychological distress ($b = -2.56$, $p < .001$). The small negative relationship demonstrates that higher levels of self-compassion are associated with lower levels of psychological distress. A significant indirect effect was found for psychological distress from self-compassion through insomnia symptoms ($b = -2.23$, $p < .001$). The pathways demonstrated that higher levels of self-compassion are associated with lower levels of insomnia symptoms and in turn that higher levels of insomnia symptoms are

TABLE 2 Correlations between the psychological variables at Study 1 and Replication Study.

Variables	1.	2.	3.	4.	5.	6.
1. SCS-SF self-compassion subscale						
Study 1	—					
Replication Study	—					
2. SCS-SF self-criticism subscale						
Study 1	.38**	—				
Replication Study	.25**	—				
3. Insomnia Severity Index						
Study 1	−.31**	−.32**	—			
Replication Study	−.19**	−.36**	—			
4. DASS depression subscale						
Study 1	−.34**	−.46**	.49**	—		
Replication Study	−.24**	−.52**	.55**	—		
5. DASS anxiety subscale						
Study 1	−.26**	−.37**	.50**	.65**	—	
Replication Study	−.27**	−.53**	.53**	.88**	—	
6. DASS stress subscale						
Study 1	−.32**	−.46**	54**	.62**	.62**	—
Replication Study	−.22**	−.51**	.56**	.83**	.82**	—

Abbreviations: DASS, Depression Anxiety and Stress Scale; SCS-SF, Self-Compassion Scale–Short Form.
**$p < .001$.

associated with higher levels of psychological distress. Fit indices suggested that the model fit the data well, χ^2 (4, $N = 722$) = 14.2, $p = .531$, NFI = 0.99, CFI = 0.99 and RMSEA = 0.06.

Self-criticism study 1

Fit was tested for a model examining the relationship between self-criticism and mental health via insomnia symptoms. The model and beta coefficients are presented in Figure 2. The findings of the mediation demonstrated a partial mediation effect that accounted for a large proportion of the variance in psychological distress ($R^2 = .55$, total effect = −5.77). A significant direct effect was found between self-criticism and psychological distress ($b = -4.04$, $p < .001$). The small moderate relationship demonstrates that higher levels of self-criticism are associated with lower levels of psychological distress. A significant indirect effect was found for psychological distress from self-compassion through insomnia symptoms ($b = -1.73$, $p < .001$). The pathways demonstrated that higher levels of self-criticism are associated with lower levels of insomnia symptoms and in turn that higher levels of insomnia symptoms are associated with higher levels of psychological distress. Fit indices suggested that the model fit the data well, χ^2 (4, $N = 722$) = 21.4, $p < .001$, NFI = 0.98, CFI = 0.99 and RMSEA = .07.

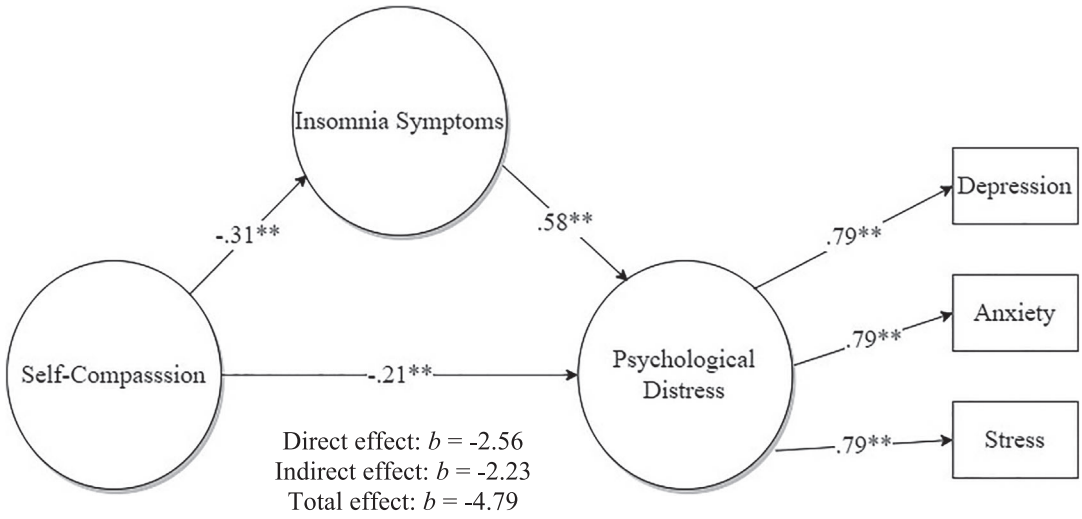

FIGURE 1 Mediation model of self-compassion predicting psychological distress via insomnia symptoms for Study 1. *Note*: Values are beta coefficients. $^{**}p < .001$.

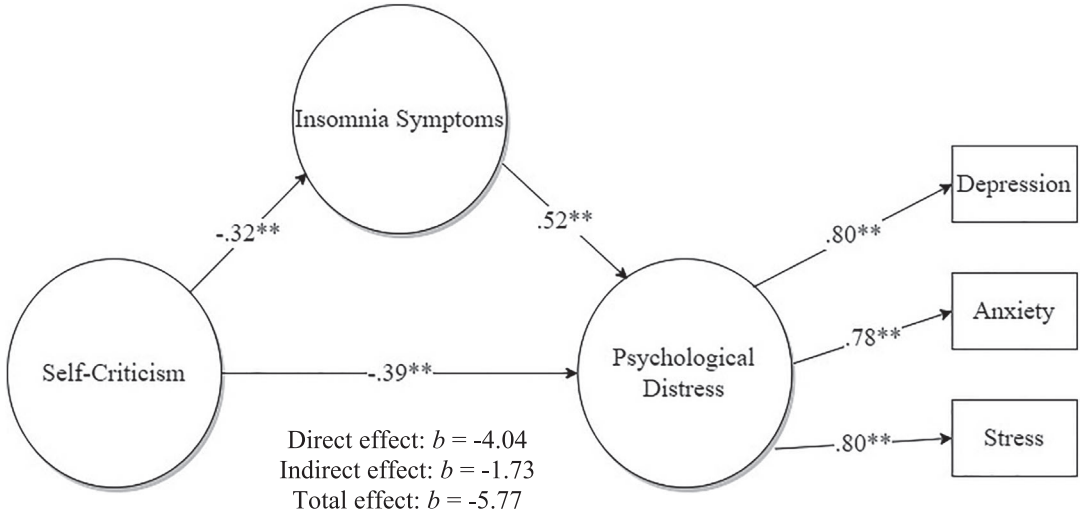

FIGURE 2 Mediation model of self-criticism predicting psychological distress via insomnia symptoms for Study 1. *Note*: Values are beta coefficients. $^{**}p < .001$.

Self-compassion Replication Study

The same model was used to examine the relationship in the replication study with the same pattern of findings. The model and beta coefficients are presented in Figure 3. The findings of the mediation demonstrated a partial mediation effect that accounted for a large proportion of the variance in psychological distress ($R^2 = .38$, total effect $= -3.60$). A significant direct effect was found between self-compassion and psychological distress ($b = -2.20$, $p < .001$). The small negative relationship demonstrates that higher levels of self-compassion are associated with lower levels of psychological distress. A significant indirect effect was found for psychological

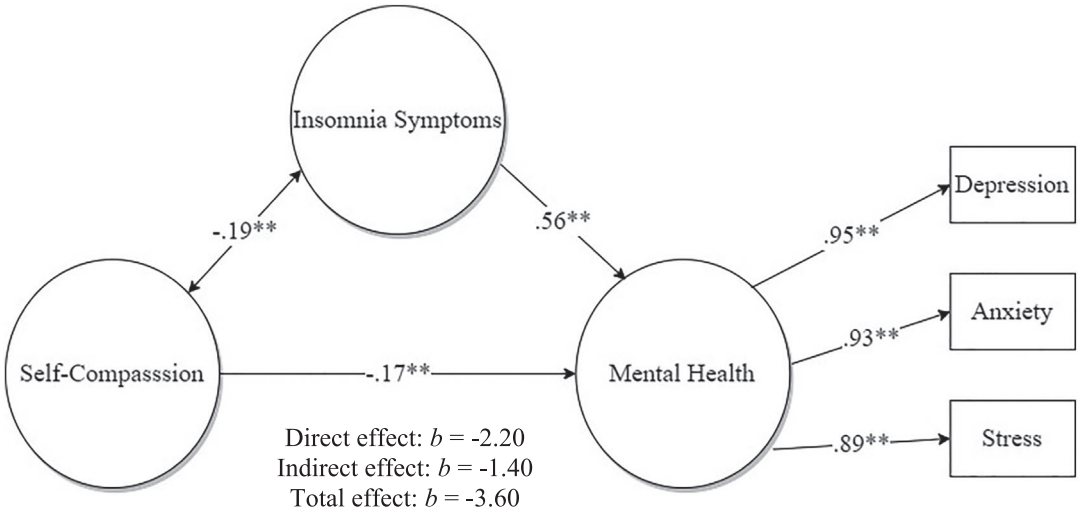

FIGURE 3 Mediation model of self-compassion predicting psychological distress via insomnia symptoms for the Replication Study. *Note*: Values are beta coefficients. $^{**}p < .001$.

distress from self-compassion through insomnia symptoms ($b = -1.40$, $p < .001$). The pathways demonstrated that higher levels of self-compassion are associated with lower levels of insomnia symptoms and in turn that higher levels of insomnia symptoms are associated with higher levels of psychological distress. Fit indices suggested that the model fit the data well, χ^2 $(4, N = 622) = 12.9$, $p = .012$, NFI = 0.99, CFI = 1.00 and RMSEA = 0.06.

Self-criticism Replication Study

The same model was used to examine the relationship in the replication study with the same pattern of findings. The model and beta coefficients are presented in Figure 4. The findings of the mediation demonstrated a partial mediation effect that accounted for a large proportion of the variance in psychological distress ($R^2 = .49$, total effect $= -6.54$). A significant direct effect was found between self-criticism and psychological distress ($b = -4.69$, $p < .001$). The moderate negative relationship demonstrates that higher levels of self-criticism are associated with lower levels of psychological distress. A significant indirect effect was found for psychological distress from self-compassion through insomnia symptoms ($b = -1.85$, $p < .001$). The pathways demonstrated that higher levels of self-criticism are associated with lower levels of insomnia symptoms and in turn that higher levels of insomnia symptoms are associated with higher levels of psychological distress. Fit indices suggested that the model fit the data well, χ^2 $(4, N = 622) = 10.5$, $p = .032$, NFI = 1.00, CFI = 1.00 and RMSEA = .09. Summary goodness of fit indices for all models is shown in Table 3.

DISCUSSION

During periods of prolonged stress, such as a pandemic, individuals experience both poorer sleep and mental health outcomes (i.e. an increase in symptoms of psychological distress;

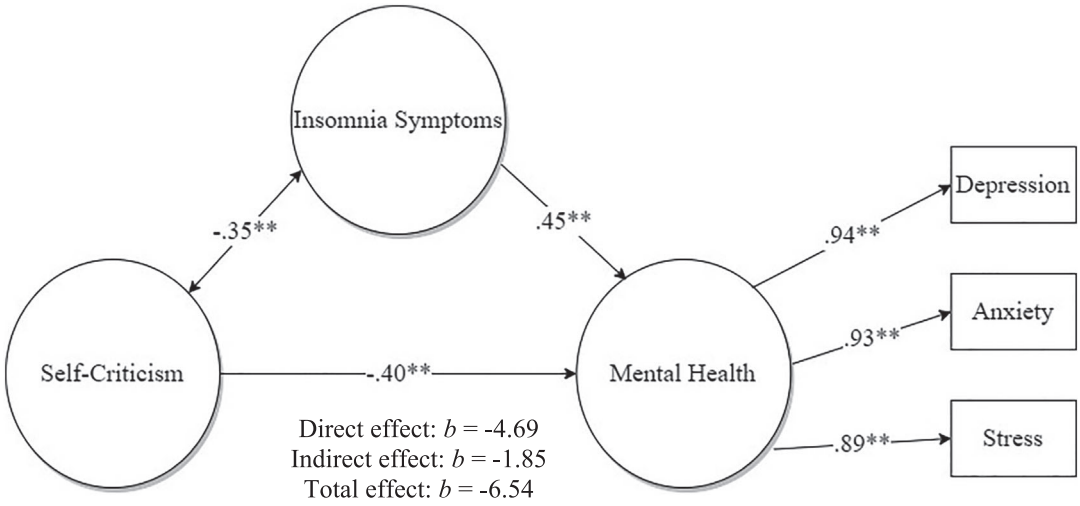

FIGURE 4 Mediation model of self-criticism predicting psychological distress via insomnia symptoms for the Replication Study. *Note*: Values are beta coefficients. $^{**}p < .001$.

TABLE 3 Goodness of fit indices for each structural equation model.

Goodness-of-fit index	Self-compassion Study 1	Self-criticism Study 1	Self-compassion replication	Self-criticism replication
NFI	.99	.98	.99	1.00
CFI	.99	.99	1.00	1.00
RMSEA (95% CI [LL, UL])	.06 [0.03, 0.09]	.07 [0.05, 0.10]	.06 [0.03, 0.10]	.09 [0.06, 0.13]
TLI	.98	.97	.99	.99

Abbreviations: CFI, Comparative Fit Index; NFI, Normed Fit Index–Short Form; RMSEA, Root-Mean-Square Error of Approximation; TLI, Tucker–Lewis Index.

Alimoradi et al., 2021; Boden et al., 2021). Greater self-compassion is linked to reduced insomnia symptoms (Brown et al., 2021; Butz & Stahlberg, 2018) and better mental health outcomes (Cheli et al., 2020; MacBeth & Gumley, 2012). The current paper aimed to examine whether higher self-compassion and lower self-criticism levels are directly associated with improved mental health outcomes and indirectly associated with insomnia symptoms (e.g. dissatisfaction with sleep quantity or quality and difficulty falling or staying asleep). Such findings may help to guide the development of future psychological interventions to simultaneously address both insomnia symptoms and psychological distress.

Specifically, we hypothesised that those with higher levels of self-compassion would be more likely to also report better mental health outcomes. Additionally, those with higher self-compassion would be likely to report fewer insomnia symptoms, leading to better mental health outcomes. Both hypotheses were supported in each study, as we found that self-compassion, directly and indirectly, affects mental health during times of prolonged stress in two samples. Notably, the size of the direct and indirect is roughly comparably in both samples, increasing the likelihood that these trends will be maintained during times of prolonged stress.

Similarly, it was found in both studies that higher levels of self-criticism were associated, both directly and indirectly, with psychological distress, supporting our hypotheses. In other words, higher levels of self-criticism predicted higher levels of insomnia symptoms, which predicted psychological distress. However, the direct pathway was found to be stronger than the indirect pathway. These findings suggest that self-critical thoughts considerably impact one's mental health at all times of the day, including when trying to sleep. Finally, it was hypothesised the results would be consistent across both studies, which was supported.

Clinical implications

The findings from both studies demonstrate the importance of the interrelationships between self-compassion and criticism with mental health outcomes via sleep. The current study further confirms that higher self-compassion and lower self-criticism levels have a protective effect on sleep and mental health, a finding well supported by past research (Brown et al., 2021; Butz & Stahlberg, 2018; Kim et al., 2021). Understanding the relative weightings of these relationships and their effects in times of prolonged stress has important clinical implications.

First, the indirect effect of self-compassion on psychological distress via sleep is similar in strength to the direct pathway. That is, improving sleep by targeting self-compassion is likely to be beneficial for mental health outcomes. This finding suggests that self-compassion strategies may have an impact when practised before sleeping, or when people wake during the night, rather than just during the day. For example, if one wakes during the night and finds themselves engaging in ruminative, anxious or self-critical talk, they can opt to engage in a self-compassion exercise such as soothing rhythm breathing or compassionate self-talk (e.g. 'it is normal to wake during the night, this does not mean I am a poor sleeper'; Germer & Neff, 2013; Gilbert, 2010). These findings further support earlier research that suggests improvements in self-compassion are associated with better sleep and psychological resilience (Kemper et al., 2015). Moreover, self-compassion can be protective against psychological distress and insomnia symptoms (Kim et al., 2021). Rakhimov et al. (2022) identified that those with lower self-compassion risk developing insomnia symptoms.

The second implication relates to the direct relationship in both studies between self-criticism and mental health, which are stronger than that of self-compassion and mental health. Therefore, improved sleep outcomes may occur as a result of initially implementing strategies focusing on the reduction of self-criticism, before specifically targeting the cultivation of self-compassion. Unlike self-compassion, based on the current findings, it is likely that strategies to lower self-criticism would be more effective if they were targeted throughout the day, not exclusively before sleep.

The current findings can be understood to be consistent with self-compassion theory. Gilbert's (2014) model of emotion regulation proposes that self-criticism triggers the threat system, activating a stress response, which consequently may impact sleep quality and quantity. The association between the threat system and poor sleep can partly be explained by nighttime cognitive arousal and maladaptive thought patterns (i.e. feeling a sense of alertness and stimulating the body's stress response with worried or ruminating thought content; Bar et al., 2020; Kalmbach et al., 2018). Increased time spent awake can result in an increased release of stress hormones (e.g. cortisol), further perpetuating feelings of alertness (Bar et al., 2020; Staner, 2003). This increase in alertness can then be misattributed to a fault of the individual's inability to fall or stay asleep, rather than recognising the underlying physiology. In other

words, they are awake due to the arousing effect of self-criticism, rather than a failing in their ability to sleep (Bar et al., 2020; Staner, 2003).

In relation to the current results, times of prolonged stress, when self-criticism is more frequent, induce increased levels of the biological markers of stress (e.g. elevated heart rate and increased stress hormone secretion), which can bring the onset of insomnia symptoms (Bonnet & Arand, 2010). Therefore, it can be inferred that self-critical thoughts may lead to nighttime cognitive-emotional reactivity (Kalmbach et al., 2018). This reactivity may impact sleep quality perception as one struggles to fall asleep or misperceives the length of typical nighttime awakenings, further heightening physiological arousal and reducing sleep quality, as physiological arousal has been demonstrated to increase insomnia symptoms (Basta et al., 2007). One such way to overcome this threat response would be to activate one's self-soothing system, which has been demonstrated to reduce the physiological stress response (Gilbert, 2014).

Although further research understanding the interaction of sleep with self-compassion and self-criticism in longitudinal and more diverse populations is required, the current results suggest self-compassion and CFT may be a suitable avenue for further assessment and testing in the treatment of sleep difficulties. More specifically, it may be helpful for clinicians to ask clients for their personal experiences of self-compassion, their typical nighttime routine and whether they have been under any prolonged stress recently (e.g. financial hardship and relationship difficulties). The clinician can then formulate any interaction between enduring stress, sleep concerns, a lack of self-compassionate thoughts or an increase in self-critical thoughts, in, or throughout, the evening for the individual. Once identified, clinicians may consider interventions that activate the self-soothing system, such as self-compassion exercises (e.g. soothing rhythm breathing or self-compassionate imagery; Germer & Neff, 2013; Gilbert, 2010).

One such intervention that activates the self-soothing system is CFT, which shows promise in treating psychological distress and insomnia symptoms (Frostadottir & Dorjee, 2019). Previous research has found a correlation between self-compassion and improved subjective sleep quality (Butz & Stahlberg, 2020) and a reduction in rumination for students with insomnia symptoms (Hadian & Jabalameli, 2019). These findings further support the crucial relationship between sleep perception (e.g. having a self-critical view of one's sleep, or oneself, at bedtime) and sleep quality, which may be improved with self-compassion interventions.

The final implication was the demonstration that these findings were replicated during two periods of prolonged stress during the pandemic. This provides us with the confidence that our findings are robust due to the length of time between sampling. Stressors experienced by both populations included extended periods of social isolation, financial pressure, health anxiety and fear of testing positive to COVID-19 (Abbas et al., 2020). As a result of these stressors, at-risk populations who experience significant hardship or prolonged stress are likely to be more self-critical and less self-compassionate. The fact that this was found across two samples in two periods of prolonged stress suggests that clinicians who have clients experiencing similar prolonged stress would benefit from using the aforementioned recommendations.

Limitations and future directions

Some limitations of the current study must be acknowledged and assist in guiding the direction of future research in the area of sleep and self-compassion. The populations in the current study were young adults, predominantly university students, whom may be more likely to experience both sleep and psychological distress than the wider population (Jiang et al., 2015). A limitation of this

study is that it is only replicated in university students. Even though we have provided strong evidence for these associations within this population, future research should demonstrate whether the findings hold outside of university students. That way, it will become clear whether the therapeutic implications can be applied across the board or if they are more focused on university students specifically. For example, there is evidence to suggest that older populations experience high levels of insomnia symptoms and psychological distress, like depression (Patel et al., 2018). Therefore, evaluating whether our findings hold for the general population could be paramount in driving future clinical practice that includes a sleep-focused component.

Similarly, the current paper looked at the concept of prolonged stress, that of being in a pandemic. This is just one experience of stress and others, such as posttraumatic stress disorder (PTSD) and trauma responses, would be worthwhile investigating to see if our results hold across a wider array of stress responses. Research suggests a link between PTSD and self-criticism (Irons & Lad, 2017), and there is a well-known relationship between PTSD and insomnia symptoms (e.g. nightmares and hyperarousal; Lamarche & Koninck, 2007). Therefore, given the overlap in relationships, there could be similar associations between self-compassion, self-criticism, sleep, acute stress and posttraumatic stress. Future research should look to replicate our findings with populations experiencing different types of prolonged, acute and posttraumatic stress to ascertain whether our findings hold across this array of stressors.

Additionally, it is important to identify if there are any potential covariates that impact our findings. Future studies should control for covariates such as what academic year students are enrolled in, whether participants are receiving mental health treatment or whether they are taking sleep-aiding medication to verify if our findings are robust. Finally, although our paper was a repeated cross-sectional study, we cannot confidently ascertain causality from our findings. The fact that the pattern of findings was repeated across the two studies provides support for longitudinal studies into these relationships. Longitudinal studies would be able to determine whether self-compassion/criticism is the causal mechanism via which we can act to modify mental health outcomes directly and indirectly via sleep. It would also be useful to do a randomised control trial on CFT for sleep to further confirm our clinical implications.

CONCLUSION

The present study revealed that insomnia symptoms mediate the relationship between self-compassion and mental health, and self-criticism and mental health in a population experiencing a period of prolonged stress. The indirect pathway through sleep yielded the strongest effect size across all studies and models. Therefore, we recommend that clinicians use interventions that involve sleep when targeting self-critical thinking styles or attempting to foster self-compassion. We have suggested a strategy that we anticipate will reduce psychological distress, given the transdiagnostic nature of self-compassion, self-criticism and insomnia symptoms. Our study's findings were robust across two studies over 1 year apart, and we anticipate that this pattern will hold during other times of prolonged stress. That said, we suggest future researchers pursue avenues for further research to expand on our findings with clinical trials for broader areas of psychological distress.

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CONFLICT OF INTEREST STATEMENT

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

The studies were approved by the Australian Catholic University (ACU) Human Research Ethics Committee (2020-110E; 2021-193E).

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