

**RESEARCH ARTICLE**

# Cognitive arousal mediates the relationship between perceived ostracism and sleep quality but it is not moderated by experiential avoidance

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Email: i.tyndall@chi.ac.uk**Abstract**

Previous research suggests that longer-term perceived ostracism is related to poor sleep quality. In this study, we investigated the mediating effect of cognitive arousal on the perceived ostracism–sleep quality relationship. We also investigated whether experiential avoidance was a moderator of the cognitive arousal–sleep quality relationship. Participants ( $N = 251$ ) were recruited through online research portals to take part in an online survey. A path analysis was used to test a moderated mediation effect between variables. It was found that cognitive arousal mediated the perceived ostracism–sleep quality relationship; however, experiential avoidance was not a significant moderator. These findings suggest that further research needs to be conducted to elucidate the mechanism of experiential avoidance to account for when it may impact sleep quality. Moreover, treatment interventions targeted at reducing cognitive arousal (e.g., cognitive behavioural therapy) prior to sleep are likely to bear some fruit.

**KEYWORDS**

acceptance and commitment therapy, experiential avoidance, ostracism, sleep quality, social rejection

**1 | INTRODUCTION**

Poor sleep quality (i.e., disrupted or inadequate) is known to have a detrimental impact on a range of emotional wellbeing and cognitive performance indicators (e.g., Brand et al., 2016; Gujan, Yoo, Hu, & Walker, 2011; Harrison & Hourne, 2000; Kirov, Kolev, Verleger, & Yordanova, 2015; Mauss, Troy, & LeBourgeois, 2013; Pitcher & Huffcutt, 1996; Walker & van der Helm, 2009), with most striking effects on mental health (see Goldstein & Walker, 2014; Palmer & Alfano, 2017, for reviews). Thus, it is apparent that there is a need to identify potential stressors that may influence quality of sleep, with a view to pinpoint key moderating or mediating variables that could be targeted therapeutically to enhance overall sleep quality. One such stressor that has been posited to negatively affect sleep quality is

ostracism or social exclusion (Chen & Li, 2019; Pereira, Meier, & Elfering, 2013). We sought to examine this putative link between perceived ostracism and reduced sleep quality within a proposed moderated mediation model. Specifically, we wished to examine whether cognitive arousal was a mediator of the perceived ostracism–sleep quality relationship. Moreover, we aimed to examine the role of a potential moderating mechanism of the link between cognitive arousal and sleep quality, that of experiential avoidance.

**1.1 | Ostracism and sleep quality**

Being ignored or excluded by others (i.e., ostracized) can be a psychologically distressing experience for many individuals. According to

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Williams (2009) Temporal Need Threat Model (TNTM), humans evolved a reflexive ostracism-detection mechanism to immediately react to perceived threats of rejection. Indeed, if one were excluded from the group as a hunter-gatherer in the past, this would risk death from predation or starvation. Therefore, according to the TNTM, when ostracized, people will rapidly become distressed as their fundamental psychological needs (i.e., belonging, control, self-esteem, meaningful existence) are depleted (i.e., the reflexive stage). Several experimental studies have replicated the consistent finding that ostracism can increase psychological distress as a function of depleting fundamental needs (e.g., Wesselmann, Wirth, Mroczek, & Williams, 2012; Williams, Cheung, & Choi, 2000; Zadro, Boland, & Richardson, 2006; Zadro, Williams, & Richardson, 2004).

However, after a period of reflection (e.g., up to 45 min in experimental studies), individuals typically recover quickly from such threats following appraisal (i.e., the reflective stage). Williams (2009) purports that individual differences occur within the reflective stage which can influence how quickly one copes with their ostracism. Several moderators of the short-term effects of ostracism have been reported in the literature including, but not limited to: social anxiety (Zadro et al., 2006), attachment style (Hermann, Skulborstad, & Wirth, 2014; Yaakobi & Williams, 2016), temporal perspective (Garczynski & Brown, 2014) and self-construal (Ren, Wesselmann, & Williams, 2013). However, of relevance to the present study, these moderators have not been investigated in the context of impact of ostracism on sleep.

According to Williams (2009), when individuals fail to cope with their ostracism, or their ostracism persists (i.e., the longer-term effects), they then enter the chronic (resignation) stage whereby they become resigned to their ostracism and experienced prolonged psychological distress (e.g., depression). Research has shown that longer-term ostracism is associated with high levels of psychological distress (e.g., Tyndall, Waldeck, Riva, Wesselmann, & Pancani, 2018; Wu, Yim, Kwan, & Zhang, 2012). There is, however, little empirical research into the longer-term effects of ostracism, and importantly, the mediators of such effects.

Although the association between ostracism and general psychological distress has been well supported in the literature, there is limited research on how ostracism is related to sleeping quality, which is the focus of the present paper. As stress can predict sleeping problems (e.g., Linton, 2004), and being ostracized is a powerful and ubiquitous social stressor (Riva, Wesselmann, Wirth, Carter-Sowell, & Williams, 2014; Williams, 2009; Williamson, Thomas, Eisenberger, & Stanton, 2018), the experiences of such events may also impact upon sleep. According to the TNTM (Williams, 2009), individuals often ruminate and worry on their ostracism (i.e., they are *cognitively aroused*) which may delay sleep onset and impair sleep quality. Indeed, such perceived events can lead to temporary impairment in executive functioning (e.g., working memory, decision making) as people dwell on their ostracism (Buelow, Okdie, Brunell, & Trost, 2015). Moreover, when people ruminate on their ostracism, this has been found to lead to more frequent reports of psychological distress (Wesselmann, Ren, Swim, & Williams, 2013). Such increases in cognitive arousal (e.g., presleep arousal) are known contributors to poor sleeping quality

(Clancy, Prestwich, Caperon, Tsipa, & O'Connor, 2020; Guastella & Moulds, 2007; Smith, Perlis, Smith, Giles, & Carmody, 2000; Toussaint, Taylor, Suvak, & Fireman, 2019).

To the best of our knowledge, there are only two empirical studies that examined the predictive relationship between ostracism and sleeping quality (Chen & Li, 2019; Pereira et al., 2013). Pereira et al. (2013) recruited 99 employees (from various industries) to participate in 2-week data collection of daily self-reported levels of perceived ostracism and a variety of sleep measures. It was found that daily workplace ostracism predicted sleep fragmentation in the following night. However, it was also shown that sleep-onset latency, sleep efficiency and self-reported sleep quality were unrelated to daily workplace ostracism (Pereira et al., 2013). Therefore, in the short-term, ostracism appears to have mixed effects on sleeping behaviour. Despite not being central to their hypotheses, Pereira et al. also tested the effects of chronic ostracism (i.e., longer-term self-reports) and the impact on sleeping quality. It was found that in contrast to the short-term effects, longer-term ostracism was significantly associated with poorer sleeping quality. It must be noted, however, that Pereira et al. (2013) did not use a full validated measure of sleeping quality as they limited this measure to a single item. Furthermore, Pereira et al. did not utilise a validated measure of ostracism, which is acknowledged by the authors who then recommend future researchers utilize the Workplace Ostracism Scale (WOS; Ferris, Brown, Berry, & Lian, 2008) when examining the longer-term effects. We propose that cognitive arousal may be a mediator of the perceived ostracism-sleep quality relationship.

## 1.2 | Experiential avoidance

A promising potential moderator of sleep quality is that of experiential avoidance (Hayes, Strosahl, & Wilson, 1999). Experiential avoidance (a component of the acceptance and commitment therapy [ACT] model of psychological flexibility/inflexibility) is defined as behaviour that attempts to 'alter the frequency or form of unwanted private events, including thoughts, memories and bodily sensations, even when doing so causes personal harm' (Hayes, Pistorello, & Levin, 2012, p. 981). Hayes et al. (2012) posit that experiential avoidance is implicated in the onset and perpetuation of psychopathology as habitually avoiding uncomfortable private events can prevent people from working towards their living in accordance with their core values. For example, if a son refused to speak to their mother after they perceived that their mother was ignoring them, but valued a close relationship with her, then this may lead to temporary relief (e.g., distraction away from feelings of anger or sadness). Indeed, experiential avoidance may be adaptive in the short-term in coping with stressful events (Hayes et al., 2012). However, if the son valued a close relationship with their mother, and continued to not live in accordance with their values (e.g., avoiding going to family events despite wanting close connection with his family) this may cause prolonged psychological distress. Attempts to suppress one's unwanted thoughts (e.g., attempting to alter the frequency or form of one's

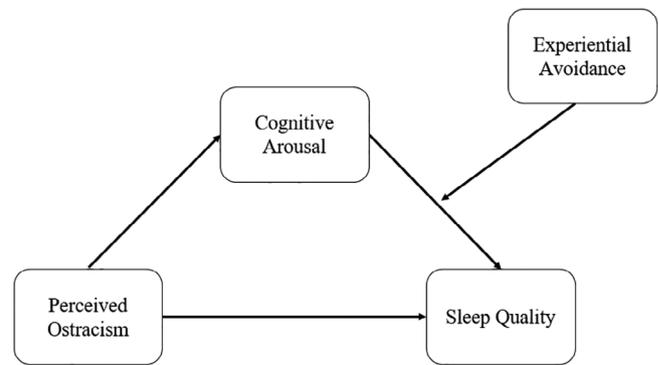
thoughts associated with ostracism) has been demonstrated to paradoxically increase the frequency and intensity of those thoughts (Wenzlaff & Wegner, 2000). Moreover, researchers have consistently shown that experiential avoidance can be a moderator or mediator of psychological distress (e.g., Bardeen, 2015; Bardeen, Fergus, & Orcutt, 2013; Kashdan & Kane, 2011; Pickett, Bardeen, & Orcutt, 2011; Roush, Brown, Mitchell, & Cukrowicz, 2019; Spinhoven, Drost, de Rooij, van Hemert, & Pennix, 2014).

Tyndall et al. (2018) found that experiential avoidance appeared to moderate the relationship between perceived ostracism and psychological distress. Specifically, at high levels of experiential avoidance, the relationship between ostracism and distress was significant; however, at low levels, the relationship was no longer significant. Thus, at low levels of experiential avoidance, people appeared to cope with or recover quicker from events such as ostracism. Such findings support the ACT model of behaviour change (Hayes et al., 2012). ACT is purported to help promote psychological flexibility (A-Tjak et al., 2015; Hacker, Stone, & MacBeth, 2016; Lee, An, Levin, & Twohig, 2015; Levin et al., 2014) and reduce reliance on experiential avoidance (i.e., increasing emotional self-regulation), to facilitate clients to work towards living in accordance with their values (e.g., the son contacting his mother in spite of feeling angry and uncomfortable in order to attempt reconciliation).

### 1.3 | Experiential avoidance and sleep quality

There is little direct empirical evidence that has examined experiential avoidance and sleeping quality. However, some researchers have theorized the role of experiential avoidance (within the broader framework of the ACT model of psychological flexibility) and its impact on sleep quality within the context of those who suffer with chronic pain (e.g., Borthelius, Jernelov, Fredrikson, McCracken, & Kald, 2015; McCracken, Williams, & Tang, 2011), and college students with depression symptoms (Peltz, Rogge, Bodenlos, Kingery, & Pigeon, 2020). It seems that there is promise for applying ACT-based therapeutic interventions to increase psychological flexibility and reduce experiential avoidance in those who present with sleep difficulties (Daly-Eichenhardt, Scott, Howard-Jones, Nicolau, & McCracken, 2016).

In a somewhat related vein, researchers have examined the effects of thought suppression (i.e., a common strategy when using experiential avoidance to avoid unwanted painful thoughts) on sleeping behaviour. For example, Harvey (2003) showed that people who were asked to suppress a self-selected (unwanted) thought before sleep, reported significantly poorer sleep quality and longer sleep-onset latency than those who were given nonsuppression instructions (i.e., asked to allow painful thoughts to come and go). This effect was observed for both people diagnosed with insomnia and those with no sleeping disorder. Similarly, people with insomnia or comorbid insomnia (e.g., also diagnosed with an anxiety disorder) tend to report that such thought control strategies are not effective in helping to increase sleeping quality in comparison to 'good sleepers' (Bélanger, Morin, Gendron, & Blais, 2005). Therefore, the use of



**FIGURE 1** The conceptual model

experiential avoidance (e.g., thought suppression) may impair sleep quality (Daly-Eichenhardt et al., 2016) as attempts to avoid unwanted psychological events (e.g., thoughts, feelings, sensations relating to one's ostracism) could perpetuate one's distress. This seems particularly pertinent given the cardinal role that sleep plays in processing our emotions (Goldstein & Walker, 2014; Kahn, Sheppes, & Sadeh, 2013; Tempesta, Succi, De Gennaro, & Ferrara, 2018; Walker & van der Helm, 2009), and subsequent capacity to regulate our own emotions (Gujan et al., 2011; Mauss et al., 2013).

### 1.4 | A moderated mediation model

There is some evidence that experiential avoidance as a construct considerably overlaps with factors that influence cognitive arousal such as rumination (e.g., Schut & Boelen, 2017; Williams, 2008) and neuroticism (Rocheffort, Baldwin, & Chmielewski, 2018). Therefore, to examine whether experiential avoidance would potentially moderate the relationship between cognitive arousal and quality of sleep we developed a path model utilizing a structural equation modelling procedure (Figure 1). We proposed that the positive relationship between perceived ostracism and sleep quality would be mediated by cognitive arousal (Hypothesis 1). Moreover, the cognitive arousal–sleep quality relationship would be moderated by experiential avoidance such that the relationship would be weaker for individuals with lower levels of experiential avoidance than for those with higher experiential avoidance (Hypothesis 2).

## 2 | METHOD

### 2.1 | Participants and procedure

Participants ( $n = 251$ ; 66.5% female; average age = 28.5 years) were recruited from a variety of online platforms (e.g., Facebook; www.reddit.com/samplesize; www.socialpsychology.org), participated on Bristol Online Surveys software, and were entered in a monetary prize draw as compensation. The majority of participants were currently residing in the United States (53.4%) or the United Kingdom (15.5%), and identified themselves as White/Caucasian (84.1%). Regarding marital status,

44.6% of participants were single, 35.1% were in a relationship, 15.5% were married, 4.2% were of other marital status. Participants were mostly either employed (45.8%) or in full-time study (41%). Those who were employed worked in a broad array of industries including health and social care (24%), education (19.4%), engineering (5.6%), computing (5.6%), arts and entertainment media (4.7%), among many others. Ethical clearance was obtained from the Institutional Ethics Committee prior to the collection of data (P69205).

## 2.2 | Predictor variables

### 2.2.1 | Perceived ostracism

We used a modified version of the 10-item WOS (Ferris et al., 2008;  $\alpha = .094$ ) on a scale from 1 (never) to 7 (always). Participants responded to statements about everyday ostracism episodes that occurred within the last 6 months without being restricted to a specific context (e.g., 'others ignored you' as opposed to 'others ignored you at work'). The modified WOS has been utilised as a measure of general perceived ostracism within the social exclusion literature (Waldeck, Tyndall, Riva, & Chmiel, 2017). An exploratory factor analysis revealed a unidimensional factor structure with the range of factor loadings .70–.86) similar in magnitude to the factor loadings reported by Ferris et al. (2008).

### 2.2.2 | Experiential avoidance

We used the 15-item Brief Experiential Avoidance Questionnaire (BEAQ; Gámez et al., 2014;  $\alpha = .86$ ). Participants answered using a 6-point Likert scale from 1 (strongly disagree) to 6 (strongly agree). Sample items include, 'The key to a good life is never feeling any pain' and 'I would give up a lot not to feel bad'.

### 2.2.3 | Presleep arousal

We used the Presleep Arousal Scale (Nicassio, Mendlowitz, Fussell, & Petras, 1985) to measure the general intensity of cognitive ( $\alpha = .84$ ) arousal experienced while attempting to go to sleep (e.g., 'can't shut

off thoughts'). Participants answered using a 5-point Likert scale from 1 (not at all) to 5 (extremely).

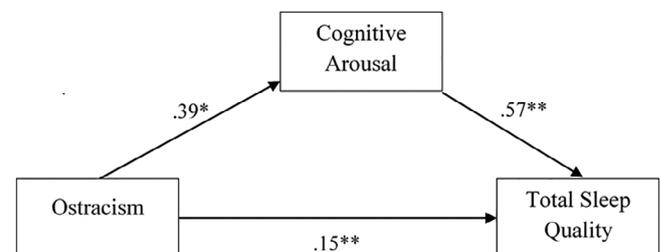
## 2.3 | Outcome variable

### 2.3.1 | Sleep quality

We used the 28-item Sleep Quality Scale (SQS; Yi, Shin, & Shin, 2006;  $\alpha = .92$ ) to assess reported sleep quality over the past month. The SQS has been demonstrated to have excellent reliability and is highly correlated with other sleep quality measures such as the Pittsburgh Sleep Quality Index (Buysse, Reynolds, Monk, Berman, & Kupfer, 1989). Participants answered using a 4-point Likert scale from 0 (few) to 3 (almost always). Sample items include, 'Difficulty in concentrating due to poor sleep' and 'Getting tired easily at work due to poor sleep'. Higher scores indicate poorer sleep quality. The SQS provides a *total score* based on six factors: daytime dysfunction, restoration after sleep, difficulty falling asleep, difficulty awakening, satisfaction with sleep, and difficulty maintaining sleep.

## 2.4 | Path analysis

We tested the mediated moderated mediation model (Figure 1) with maximum likelihoods estimations for path coefficients. We evaluated model fit using several fit indices and assessed convergence between findings (Byrne, 2010), namely, relative  $\chi^2$ , the goodness of fit index (GFI), comparative fit index (CFI) and root mean square error of approximation (RMSEA) as these are the most commonly used indices (Yuan &



**FIGURE 2** Empirical model for mediation effect of cognitive arousal on the relationship of ostracism and total sleep quality.  $N = 251$ ; \*\* $p < .01$

**TABLE 1** Means, SD and correlations between study variables ( $N = 251$ )

Variables	1	2	3	4
1. Workplace Ostracism Scale				
2. Brief Experiential Avoidance Questionnaire	.35**			
3. Presleep Arousal Scale	.43**	.39**		
4. Sleep Quality Scale	.39**	.34**	.65**	
Mean	22.22	51.06	24.76	37.31
SD	10.86	12.42	8.36	15.39

Note: \*\* $p < .001$ .

**TABLE 2** The fit indices of the structural equation model tested

	Model	$\chi^2$ (df)	$\chi^2/df$	RMSEA (90% CI)	GFI	CFI
M1	(Figure 2)	29.49 (2)	14.84	.23 (.16, .31)	.96	.90

Note: Root mean square error of approximation (RMSEA), goodness of fit index (GFI), adjusted GFI (AGFI) and comparative fit index (CFI) > 0.9 indicate adequate fit.

Bentler, 2007). The relative  $\chi^2$  is calculated by model  $\chi^2$ /degree of freedom (*df*). GFI calculates the proportion of variance that is accounted for by the estimated population covariance (Tabachnick & Fidell, 2007). The CFI tests the relative fitness by comparing the current model to a baseline model about the better explanation for the covariance structure. CFI values >0.90 indicate good fit of the model. The RMSEA indicates how well the model would fit the populations covariance matrix (Byrne, 1998).

### 3 | RESULTS

All questions were subject to forced-choice responding. Therefore, there was no missing data within the dataset. Means, *SD* and Spearman's rho bivariate correlations are among the key variables are presented in Table 1. As indicated, perceived ostracism ( $r_s = .39$ ,  $p < .001$ ), and experiential avoidance ( $r_s = .34$ ,  $p < .001$ ) had a significant moderate positive correlation with sleeping quality.

A Harmon-one factor test was conducted to examine if common method variance was a concern for this study. It was found that a one factor model accounted for 24.8% of the variance which is lower than the 25% recommended by Williams, Cote, and Buckley (1989). Therefore, common method bias is unlikely to a pervasive problem for this study.

#### 3.1 | Path analysis findings

Five observable variables were tested in the model. The model (Model 1; see Figure 2) shows nonsignificant paths for experiential avoidance as moderator ( $\beta = 0.09$ ,  $p = .07$ ). The empirically supported model as well as the standardized coefficients are shown in Table 2. The model revealed a significant model fit statistic with  $\chi^2$  (2, 251) = 29.49,  $p < .01$ . The RMSEA index of the model indicated poor fit. However, both CFI and GFI of more than 0.9 indicated a good fit (Hooper, Coughlan, & Mullen, 2008; Kline, 2005). Ostracism yielded a statistically significant path to sleep quality (explaining 15% of the variance). The path coefficient from ostracism to cognitive arousal was statistically significant (explaining 39% of variance). Cognitive arousal yielded a statistically significant path to sleep quality (explaining 57% variance). Additional sensitivity analyses were conducted by exploring the effects of the model with known covariates. Age, gender and ethnicity were added to the model as covariates and did not reveal a significant association with the variables.

### 4 | DISCUSSION

The goal of the present study was to examine a proposed moderated mediation model whereby cognitive arousal may mediate the relationship between perceived ostracism and sleep quality, and experiential avoidance is a moderator of the effects of arousal. Consistent with prior literature (e.g., Chen & Li, 2019; Pereira et al., 2013), ostracism was found to be related to poor sleep quality. Moreover, we found that cognitive arousal appeared to mediate the perceived ostracism–sleep quality relationship, which supports prior theory (TNTM; Williams, 2009) and literature to suggest that arousal (e.g., worry, rumination) can maintain the negative effects of ostracism (e.g., Wesselmann et al., 2013). Therefore, one tentative argument could be that some ostracized individuals have poor sleep quality as their needs are still thwarted, and as such, significant resources are devoted to self-regulate themselves (e.g., dwelling on the reasons behind one's ostracism). Future researchers may consider exploring the experience of threatened psychological needs further by using qualitative methods (e.g., interpretative phenomenological analysis [Smith & Shinebourne, 2012]) with ostracized individuals who suffer sleep disorders.

Contrary to our expectations, however, experiential avoidance was not a significant moderator of sleep quality. This was somewhat unexpected given the negative impact of engaging in *experiential avoidance-like* techniques (e.g., thought suppression; thought control; Bélanger et al., 2005; Harvey, 2003; Harvey, Tang, & Browning, 2005) on sleep. Similarly, despite not being central to our hypotheses, we also found that experiential avoidance was not a significant moderator of the perceived ostracism–sleep quality relationship. This was somewhat surprising considering Tyndall et al. (2018) reported that experiential avoidance moderated effects of perceived ostracism on psychological distress over time. Given that no specific measure of psychological distress (e.g., depression, anxiety, or stress) was administered in the present study we cannot, of course, conclude that experiential avoidance does not moderate psychological distress from perceived ostracism. Rather, within the context of sleep quality, level of self-reported experiential avoidance does not appear to significantly influence quality of sleep.

Experiential avoidance and rumination have been postulated to 'load on the same latent factor of perceived inability to control negative thinking' (Schut & Boelen, 2017, p. 11; see also Spinhoven, Drost, de Rooij, van Hemert, & Pennix, 2016). Similarly, Williams (2008) viewed rumination and experiential avoidance as similar *modes of mind*, or mode of mental processing, and thus it is a noteworthy finding that experiential avoidance did not predict or moderate difficulty

in falling asleep in the present study. It should be acknowledged that as the majority of research that found a link between experiential avoidance and psychological distress used the Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011), whereas we employed the BEAQ (Gámez et al., 2014) in the present study, it could be argued that it is not a faithful test of an association between experiential avoidance and quality of sleep. However, there is emerging consensus that the AAQ-II lacks discriminant validity as a measure of experiential avoidance (e.g., Rochefort et al., 2018; Tyndall et al., 2019; Wolgast, 2014) as distinct from psychological distress or negative emotionality, and thus the BEAQ served as a more focused measure of the construct.

Our study has some strengths to report. One strength is that this study, to the best of our knowledge, is the first to examine the role of experiential avoidance as a moderator of sleeping behaviour, as well as accounting for the predictive role of perceived ostracism. Second, we used validated measures of perceived ostracism and sleeping quality as recommended by Pereira et al. (2013). However, it could be noted that as we have modified the WOS (Ferris et al., 2008), this potentially could be considered to be a new measure, and thus unvalidated. The modified WOS was found to be reliable and held to a single factor structure within the context of this study. Furthermore, the modified WOS (to measure general perceived ostracism) has been utilised in previous studies within the ostracism literature (e.g., Tyndall et al., 2018; Waldeck et al., 2017). Third, we obtained an adequate sample size for the purpose of this exploratory study as it was higher than the acceptable sample to parameter ratio (10:1) in a path-analysis (Jackson, 2003).

However, our study has some limitations that should be noted. First, as all data came from the same source at one timepoint, this increases the risk of common method bias. However, we do not believe this to be a pervasive problem as the Harman one-factor test yielded a relatively low percentage of variance explained for a common method factor. Second, there were potential confounding and/or moderating variables which were not accounted for in this study (e.g., participants with mental health diagnoses, sleep disorders). Indeed, some individuals (e.g., those diagnosed with social anxiety disorder; Zadro et al., 2006) are more likely to be more sensitive to and catastrophise their ostracism than others. We therefore propose that future researchers control for sensitivity to experiences of rejection. Third, all measures collected were self-report which limits the conclusion that can be drawn from the findings. Research has demonstrated that there are discrepancies between subjective and objective sleep reports (e.g., Baker, Maloney, & Driver, 1999; Klumpp et al., 2017; Landry, Best, & Liu-Ambrose, 2015). Therefore, we recommend future researchers include objective measures of sleep quality (e.g., actigraphy) as well as subjective measures. It is important to note, however, that obtaining objective reports of perceived ostracism outside the laboratory (e.g., using Cyberball) may prove difficult. For example, Waldeck (2017) discussed how the *perception* of ostracism is important when measuring its effects, and the fact that someone is ostracized does not necessarily indicate that they are *feeling* ostracized. Thus, one potential strategy for increasing triangulation could be for researchers to obtain qualitative data (e.g., interviews) to account for such differences.

Future researchers could consider using a daily diary or experiencing sampling (e.g., Tousignant et al., 2019) method to gain a more in-depth and longitudinal picture of the relationship between perceived ostracism and sleep quality over time. Furthermore, whereas experiential avoidance did not appear to be linked with poorer quality of sleep in the present study, this does not mean that the broader construct of psychological inflexibility (of which experiential avoidance is but one of six components) might not impact sleep quality (see Daly-Eichenhardt et al., 2016; McCracken et al., 2011) or moderate the effects of perceived ostracism (see Waldeck et al., 2017). Thus, researchers could examine whether psychological inflexibility itself, or a combination of subcomponent processes (e.g., cognitive fusion, self-as-content, lack of committed action, lack of present moment awareness, lack of connection to values; see Tyndall et al., 2020) have a moderating or mediating influence on quality of sleep. Given the known effects of rumination on sleep onset (e.g., Guastella & Moulds, 2007; Tousignant et al., 2019), further research is needed to unpack whether experiential avoidance and rumination do share a similar latent factor or whether they are quite distinct psychological constructs with different effects on sleep.

## 5 | CONCLUSION

The present study supported the findings in the literature that perceived ostracism is a predictor of poor sleep quality (Chen & Li, 2019; Pereira et al., 2013). Moreover, we found that cognitive arousal is a mediator of this relationship. However, experiential avoidance was not a moderator of sleep quality despite a large body of literature highlighting key moderating and mediating effects of experiential avoidance in self-reported distress. Further research needs to be conducted to explore the mechanism of experiential avoidance in the context of sleep, given a focus in some studies on increasing psychological flexibility and acceptance in chronic pain patients concerning their sleep difficulties (Daly-Eichenhardt et al., 2016; McCracken et al., 2011), and college students with depressive symptoms (Peltz et al., 2020), as the present data suggests that interventions designed to reduce cognitive arousal prior to sleep might be most promising. Indeed, it is perhaps unsurprising that cognitive behavioural therapy (e.g., CBT-i for insomnia) is consistently regarded in the literature as the gold-standard nonpharmacological treatment for sleep difficulties (Koffel, Koffel, & Gehrman, 2015; Murtagh & Greenwood, 1995; Van Straten et al., 2018), with particular focus on intervention techniques such as cognitive restructuring designed to target processes such as presleep cognitive arousal (Bélanger et al., 2005; Lancee et al., 2019). Through a specific focus on process-based therapy (Hofmann & Hayes, 2019), future researchers can more systematically identify the key mechanisms that mediate sleep difficulties to serve as targets for therapeutic intervention in either CBT- or ACT-based treatment packages.

## CONFLICT OF INTEREST

The authors declare no potential conflict of interest.

## DATA AVAILABILITY STATEMENT

The dataset for this paper is not part of a larger dataset. The dataset for this paper is archived on the Open Science Framework Repository via the following link: [https://osf.io/tvxsy/?view\\_only=ae4713acbbf14d26a75ef6148ec30a3e](https://osf.io/tvxsy/?view_only=ae4713acbbf14d26a75ef6148ec30a3e).

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## ENDNOTE

<sup>1</sup>We ran an additional analysis to examine whether experiential avoidance was a moderator of the relationship between perceived ostracism and sleeping quality. Similarly, the results showed a non-significant path for experiential avoidance as a moderator ( $\beta = 0.04, p = .46$ ).

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