Sleep and Counterproductive Work Behaviours: A Daily Diary Study

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Abstract

Recognising the indisputable negative repercussions of poor sleep quality on individual well-being and behaviour, researchers are becoming increasingly interested in the potential organisational consequences of the present 'sleeplessness epidemic'. Nonetheless, our knowledge on the potential organisational consequences of poor sleep is limited. As such, we advance this field by examining the relationship between sleep and counterproductive work behaviours (CWB). Adopting a social exchange perspective, this paper proposes that poor sleep quality may negatively impact employee perceptions of interpersonal justice, and subsequently, increase engagement in CWB towards both the organisation and individuals. We also consider the moderating roles of individual differences: neuroticism and dispositional mindfulness in the sleep-justice-CWB relationships. We tested our research model with a sample of 156 employees using a daily diary design over the course of a five-day working week. Results demonstrated that sleep quality the night before is significantly and negatively related to CWB towards individuals the following day. However, interpersonal justice did not significantly mediate this relationship; neither neuroticism nor dispositional mindfulness moderate the sleep-justice-CWB relationships. This paper makes important theoretical contributions by offering additional insights into the daily relationship between sleep and employee behaviour.

Keywords: sleep, counterproductive work behaviour, interpersonal justice, social exchange

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"I was once so exhausted that I emptied the washing machine and put all of the clothes in the fridge. As I closed the door and walked away, I looked at the empty basket and realised what I'd done." (Daily Mail, 2019).

Such anecdotes which treat poor sleep as a source of amusement are ubiquitous, their popularity illustrating just how common inadequate sleep is within our society. Studies consistently report that over a third of the population typically sleep for less than the recommended minimum of seven hours per night (Lee & Sibley, 2019; Centers for Disease Control and Prevention, 2017). More recent research conducted by Manatū Hauora (2021), corroborated the findings of previous studies by reporting that a significant number of people continued to report inadequate sleep quality during the Covid-19 pandemic. Thus, demonstrating the enduring nature of this 'sleeplessness epidemic' Many believe that the current epidemic is the result of society's glorification of productivity, 'busy-ness' and 'hard work' often to the detriment of individual well-being (Rafique et al., 2020; Shochat, 2012; van Cauter et al., 2008). However, sacrificing sleep for success may be counterintuitive, with empirical evidence showing that inadequate sleep is associated with increased absenteeism and turnover intentions as well as reduced job satisfaction, task performance, motivation, and productivity (Krauss et al., 2003; Litwiller et al., 2017). Thus, the current pattern of poor sleep poses a serious threat to organisations. Despite the breadth of research examining the organisational repercussions of poor sleep, to date, the relationship between sleep quality and subsequent engagement in counterproductive work behaviour (CWB) has not yet been explored.

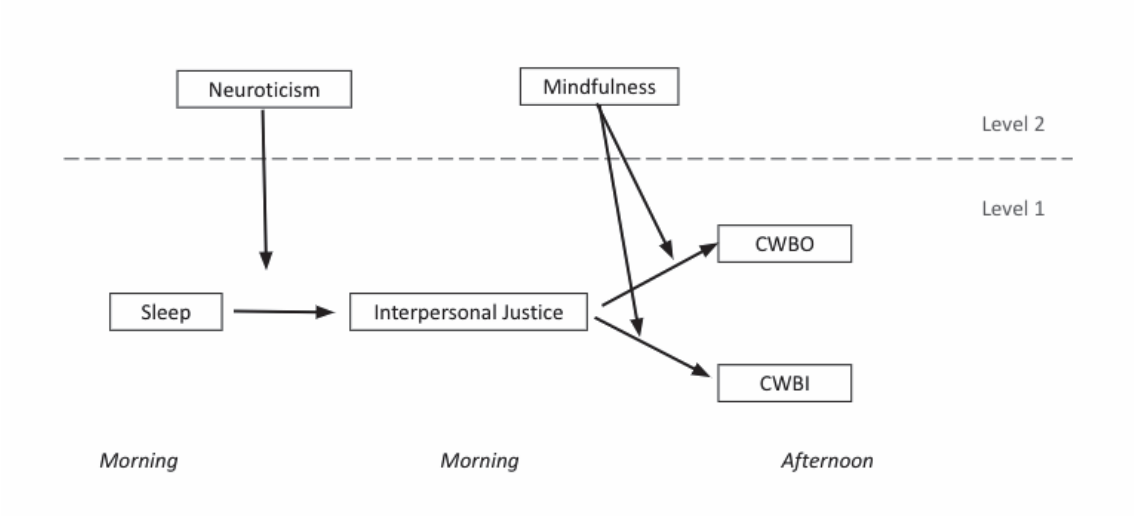
Defined as any intentional action taken by an employee that harms their organisation or its stakeholders (e.g., other employees, customers, or suppliers), CWB are often categorised into one of two dimensions; those directed at individuals (CWB-I) or those targeting

organisations (CWB-O) (Chang & Smithikrai, 2010; Fox & Spector, 2005; Hafidz, 2012; Sackett, 2002; Yang & Diefendorff, 2009). Such distinction is critical in recognising that not all CWB are created equal. Consisting of psychologically or physically damaging behaviours directed towards co-workers and others, CWB-I are often categorised as 'general abuse' and refer to actions such as harassment or bullying. On the other hand, CWB-O consist of more specific behaviours such as production deviance, theft and sabotage (Ho, 2012).

Given the broad spectrum of employee behaviours that might be characterised as counterproductive, its prevalence within organisations is unsurprising. Harper (1990) found that up to 75% of employees have engaged in some form of CWB at least once in their working life. Moreover, contemporary workplaces provide *even more* opportunities for employees to behave counterproductively e.g., cyberloafing (Lim, 2002; Liberman et al., 2011; Mercado et al., 2017). It is therefore reasonable to assume that the proportion of employees who have engaged in CWB at some point has likely increased since Harper's 1990 study. The organisational and financial consequences of employee engagement in CWB are profound. For example, employee theft is estimated to cost American businesses approximately $50 billion annually (Statistic Brain Research Institute, 2018) and accounts for up to 20% of business failures (Coffin, 2003). More recently, researchers provide further insight into the costs of CWB, finding that cyberloafing, a type of CWB, costs American organisations upwards of $85 billion annually in lost productivity (Alder et al., 2006).

Due to their significant organisational consequences, CWB have attracted considerable attention within organisational psychology research. Existing research has however largely overlooked the relationship between sleep quality and CWB. In order to contribute to existing knowledge of the impact of poor sleep on employee behaviour, this study designed and tested a research model investigating the mediation role of interpersonal justice and the moderating roles of neuroticism and mindfulness on the relationship between sleep quality and CWB.

Drawing on previous research, we predicted that poor reported sleep quality would be linked



to increased subsequent engagement in CWB-I and CWB-O. Social exchange theory (SET) provides a useful theoretical lens in explaining this relationship, whereby interpersonal justice perceptions could mediate the link of sleep to CWB-I and CWB-O. As individual reactions to inadequate sleep and perceptions of justice vary, we investigated the moderating effect of trait neuroticism on the relationship between sleep quality and interpersonal justice perceptions. Similarly, individual differences also influence how a person may respond to perceptions of justice. As such, the moderating effect of dispositional mindfulness on the relationships between interpersonal justice and both CWB–I and CWB-O were examined (see Figure 1).

Figure 1

Proposed Research Model

In testing the above model through the implementation of daily diary surveys, we made the following theoretical contributions.

First, by analysing the relationship between sleep quality and CWB via the mediator of interpersonal justice, the current study aimed to contribute to the existing sleep-work literature. While quality of sleep has previously been studied in relation to both social interactions (Barnes & Watson, 2019) and employee behaviour (Krauss et al., 2003), we do

not know how both may relate to sleep quality. Thus, consolidation of these previous findings is required. By examining the ways in which sleep quality may influence interpersonal justice perceptions and, therefore, CWB-I and CWB-O, this study extends the previous literature. Therefore, providing a deeper understanding of how poor sleep may affect employee behaviour.

Second, this study recognises the significance of individual differences in determining how poor sleep may affect a person and how they may perceive situations. By investigating neuroticism as a boundary condition in the relationship between sleep quality and interpersonal justice perceptions, we assess the possibility that between-person differences may lead to some employees being more likely to experience the negative effects of poor sleep than others. This adds further nuance to the current academic understanding of the interaction between sleep quality and employee perceptions. Moreover, assessing neuroticism as a boundary condition has important practical contributions. For example, identifying the factors that may make employees more likely to experience the negative effects of poor sleep could be useful to managers who are selecting employees for positions that may compromise sleep (Christian & Ellis, 2011).

Finally, this study examines dispositional mindfulness as a boundary condition for the relationship between interpersonal justice and CWB. Understanding how mindfulness serves as a buffer between interpersonal justice perceptions and retributory behaviours (i.e., CWB-I or CWB-O) is of particular use for organisations since an individual's level of mindfulness is not fixed, rather, it can be developed and enhanced through strategies such as mindfulness meditation (Brown & Ryan, 2003). As a result, exploring mindfulness as a boundary condition makes significant contributions by potentially providing managers with a pathway through which they may be able to improve organisational outcomes.

The Conceptualisation of Sleep

On average, humans spend approximately one-third of their lives sleeping (Sejnowski & Destexhe, 2000). For many, the term ‘sleep’ may conjure images of a time when you lie down, close your eyes, and dream before awakening refreshed. However, research suggests that sleep is a little more complicated than that. According to a simple behavioural definition, sleep is a naturally reoccurring and complex amalgam of physiologic and behavioural processes characterised by perceptual disengagement from and unresponsiveness to one's external environment (Carskadon & Dement, 2011). Within this amalgam are two broad types of sleep; rapid eye movement (REM) and non-REM (NREM) that the brain continuously cycles between (Peigneux et al., 2012).

Silber et al. (2007) state that NREM consists of three distinct stages. Stage 1 refers to drowsiness and sleep onset when a person's brain and motor movements begin to slow. Stage 1 only lasts a few minutes before moving into Stage 2, where sleep is light. Stage 3 of NREM, or slow-wave sleep (SWS), is a phase of deep sleep. REM sleep is defined by episodic bursts of rapid eye movements, EEG activation and muscle atonia and is the period most associated with dreaming (Carskadon & Dement, 2011). Each stage of this sleep cycle is essential for both physical and mental well-being.

While sleep is a natural and essential function for humans, its perceived 'intrinsic passivity' means that many regard sleep as a waste of time and, therefore, money (Crary, 2014). However, as sleep research develops, it becomes increasingly evident that sleep is much more than just an 'inconvenience' for those pursuing success. While there is yet to be a clear consensus on the specific function(s) of sleep, a growing body of evidence demonstrates that, among other things, it is essential for optimal cognitive and interpersonal functioning (Durmer & Dinges, 2005; Franzen et al., 2008; Lowe et al., 2017). Consequently, sleep has become a topic of growing interest within the organisational psychology literature.

Organisational research typically conceptualises sleep as one of two similar yet very distinct constructs; sleep quantity and sleep quality (Barnes et al., 2011; Litwiller et al., 2017). Barnes (2012) defines sleep quantity as the amount of time spent in a sleep state. On the other hand, sleep quality refers to any difficulty in falling asleep, sleep maintenance, sleep disturbances throughout the night, total sleep time and how rested and refreshed one feels upon waking (Harvey et al., 2008). Sleep quantity is a fundamental component of sleep and is a straightforward measure often used to quantify sleep issues within our society (e.g., Centers for Disease Control and Prevention, 2017; Lee & Sibley, 2019). However, sleep quality is more relevant to health, well-being, and sleepiness measures than quantity in non-clinical populations (Pilcher et al., 1997). Litwiller and colleagues concluded that sleep quality is more strongly associated with constructs reflecting perceptions or emotions (e.g., general strain) than sleep quantity. This suggests that sleep quality may have more explanatory value than sleep quantity. As such, this study will specifically focus on perceived sleep quality in relation to interpersonal justice and subsequent CWB.

Sleep and Perceptions of Interpersonal Justice

Despite the well-established impact of insufficient sleep on social interactions (Barnes & Watson, 2019) and employee behaviour (Krauss et al., 2003), further research is required to better understand how insufficient sleep may influence perceptions of social interactions in the workplace, particularly those pertaining to interpersonal justice.

According to Colquitt et al. (2001), interpersonal justice refers to the degree to which people perceive that they are treated with politeness, dignity and respect within their organisation and is one of four key dimensions of organisational justice (i.e., distributive, procedural and informational justice; Loi et al., 2009; Mengstie, 2020). Of the four elements of organisational justice, interpersonal justice is thought to be the most critical in determining employee behaviour and, as such, has the strongest relationship to counterproductive and

deviant behaviours in the workplace. (Judge et al., 2006; Holtz & Harold, 2010). Budnick and Barber (2015) found that insufficient sleep puts employees in a vulnerable state, increasing their threat vigilance and making them less likely to trust others in social interactions while also increasing their sensitivity to perceived unfairness and incivility.

There is also plentiful empirical evidence stating that poor sleep is associated with a negative cognitive bias (Tempesta et al., 2020; Gobin et al., 2015; Franzen et al., 2009; Yoo et al., 2007). In research conducted by Tempesta and colleagues, inadequate sleep negatively influenced a person's appraisal of pleasant and neutral stimuli, thus imposing a negative emotional bias. Physiological evidence of this cognitive bias also exists, with Franzen et al. reporting that only sleep-deprived participants displayed significantly larger pupil diameter when viewing negative stimuli versus positive or neutral stimuli and showed anticipatory pupillary reactivity during blocks of negative pictures. Additionally, Yoo et al. (2007) reported that sleep-deprived participants exhibited significantly greater amygdala activation in response to increasingly negative stimuli when compared to those in the control group.

Considering the negative cognitive bias that has been shown to result from inadequate sleep, it is reasonable to assume that workplace interpersonal interactions and perceptions of these interactions would not be exempt from this bias. Thus, we propose that employees who report poorer quality of sleep the night prior will be more likely to perceive ambiguous and even positive interactions as being negative, leading to decreased interpersonal justice perceptions within the workplace.

Hypothesis 1: There will be a positive relationship between sleep quality and perceptions of interpersonal justice.

Sleep and CWB: The Mediating Effect of Daily Interpersonal Justice.

A considerable body of evidence identifies employee experience of interpersonal justice as an important predictor of CWB (Robinson & Greenberg, 1998; Judge et al., 2006;

Ferris et al., 2010). Studies examining employees' negative behavioural responses to poor interpersonal justice in the workplace consistently identify CWB as a common form of retribution in organisations (Bies & Tripp, 2005; Skarlicki & Folger, 1997). As such, we expect that the decreased interpersonal justice perceptions as a consequence of poor sleep may lead to increased engagement in CWB. That is, interpersonal justice will serve as a mediator in the relationship between poor sleep quality and CWB.

As one of the most influential theoretical paradigms for understanding behaviour in the workplace, social exchange theory provides a valuable lens to examine the relationship between workplace interpersonal justice perceptions and employee behaviour (Colquitt et al., 2013). At its core, social exchange theory is guided by the norm of reciprocity (Cropanzano & Mitchell, 2005) which refers to the common social expectation that people in an interpersonal encounter or relationship should benefit equally from their interactions. As stated by Perugini et al. (2003), this social norm stipulates that to achieve equitable outcomes, one should help those who have previously helped them and retaliate against those who have been detrimental to their interests.

In an interdisciplinary review of the social exchange theory, Cropanzano and Mitchell (2005) reinforced the significant role that social exchanges play in influencing individual behaviour within the workplace. That is, perceptions of fairness in social transactions often lead to a positive workplace attitude and more effective behaviour as people strive to return the benefits they have received. While reciprocity within social exchanges is typically thought of in a positive context, negative reciprocity also occurs, wherein the unfavourable treatment is returned (Cropanzano & Mitchell, 2005; Eisenberger et al., 2004). The social exchange perspective of negative reciprocity suggests that employees who report experiencing unfair treatment, such as low daily interpersonal justice, are likely to respond with a negative retributory behavioural response, such as CWB.

Through drawing on empirical evidence and applying the social exchange perspective, we expect that employee perceptions of interpersonal justice will mediate the relationship between sleep quality and CWB, with employees who report experiencing low interpersonal justice because of inadequate sleep being more likely to engage in CWB. By examining the relationships of sleep with CWB-I or CWB-O through the mediating role of interpersonal justice, we hope to provide deeper insight into exactly *how* poor sleep quality influences employee CWB.

Hypothesis 2: Perceptions of interpersonal justice will be negatively associated with CWB-I (H2a) and CWB-O (H2b).

Hypothesis 3: Sleep quality will be positively associated with CWB-I (H3a) and CWB-O (H3b) through the mediating variable of interpersonal justice.

The Moderating Effect of Neuroticism on the Relationship between Sleep Quality and Interpersonal Justice

While we propose that there will be a negative relationship between poor sleep and interpersonal justice, it is critical to consider the impact of individual differences as boundary conditions for this relationship.

Given that trait neuroticism significantly influences situation perceptions (Serfass & Sherman., 2013) and exacerbates the adverse effects of suboptimal quality of sleep (Goldstein et al., 2013), we propose that neuroticism may moderate the relationship between sleep quality and interpersonal justice. That is, the negative relationship between reported quality of sleep and interpersonal justice perceptions may be stronger for highly neurotic employees than those who are low in neuroticism.

Piedmont (2013) asserts that individuals who score highly in trait neuroticism tend to be tense, apprehensive and emotionally unstable and prone to feelings of hopelessness, guilt,

sadness, and loneliness. Highly neurotic individuals also have a greater tendency to experience anger, feelings of inferiority, shame, and often find it challenging to control urges.

In short, the trait of neuroticism refers to the propensity to experience negative emotions (Leary & Hoyle, 2009). Therefore, it is hardly surprising that neurotic individuals tend to perceive their experiences, interactions and surroundings more negatively than objective observers might (Denissen & Penke, 2008; McCrae & Costa, 2003; Ozer & Benet-Martínez, 2006). That negative tendency may be partially attributed to the fact that individuals high in trait neuroticism are more sensitive to potential social exclusion and have greater threat reactivity to both non-social and social cues (Denissen & Penke, 2008). As such, people who are highly neurotic are more sensitive to unfair treatment clues (Schmitt et al., 2005). This sensitivity is reflected in organisational justice literature, with Törnroos et al. (2018) reporting that neurotic employees are more likely to report low justice in their workplaces.

Moreover, Goldstein et al. (2013) provided indirect evidence and reported that high trait anxiety further intensifies the impact of sleep loss on pre-emptive responding in the anterior insula. These findings indicate that tired individuals who exhibit high levels of anxiety are more likely to perceive and anticipate adverse threats. Given that anxiety is a key facet of trait neuroticism (Piedmont, 2013), it is reasonable to assume that neuroticism may exacerbate the severe impact inadequate sleep has on the brain.

Additionally, the lability of mood associated with high neuroticism suggests that neurotic employees are more likely to experience the negative effects associated with a lack of sleep (Blagrove & Akehurst, 2001). As previously mentioned, we propose that one repercussion of poor sleep quality may be an increased sensitivity to experiences of low interpersonal justice. Thus, the negative relationship between sleep quality and interpersonal justice might be stronger among employees who report poor sleep quality.

On the other hand, among those with low trait neuroticism, the effects of poor sleep on interpersonal justice perceptions may be weakened. Compared to those high in trait neuroticism, individuals who demonstrate low neuroticism (also referred to as high emotional stability) are calm, imperturbable, confident and report greater work satisfaction (Hills & Argyle, 2001). As such, people with low neuroticism may be less vulnerable to the negative effects of low quality of sleep, and therefore be less likely to report low interpersonal justice despite poor sleep quality the night prior. Evidence of the weakened relationship between sleep quality and interpersonal justice among those low in neuroticism is provided by Mastin et al. (2005). Mastin and colleagues concluded that participants with low levels of neuroticism reported less negative effects of poor sleep on subjective alertness, were less vulnerable to mood declines following inadequate sleep and demonstrated greater resilience in behavioural performance after this poor sleep. Therefore, among those with low trait neuroticism, the negative effects of poor quality sleep on the likelihood of reporting low interpersonal justice may be reduced.

Considering the breadth of empirical evidence that points to the significance of trait neuroticism as a moderating variable in the relationship between sleep quality and interpersonal justice, we propose the following hypothesis.

Hypothesis 4. Trait neuroticism will moderate the positive relationship between sleep quality and interpersonal justice such that the positive relationship between sleep quality and interpersonal justice is stronger (vs. weaker) under high (vs. low) trait neuroticism.

The Moderating Effect of Dispositional Mindfulness on the Relationships between Interpersonal Justice and CWB-I and CWB-O.

Just as individual differences influence an employee's perception of social exchange, individual differences may affect how a person responds to in/justice perception. As stated by

Cropanzano and Mitchell (2005), while the norm of reciprocity may be universally accepted, the degree to which people may apply its principles varies. Therefore, the notion that perceptions of a lack of justice will *always* result in retaliatory behaviour is overly simplistic. Holtz and Harold (2010) concluded that a perceived lack of justice does not always result in deviant behaviour, with individual differences playing an essential role in shaping employees' behavioural responses to justice perceptions.

A growing body of research suggests that dispositional mindfulness may significantly influence an individual's reaction to feelings of low justice (Long & Christian, 2015). A concept notoriously difficult to define, mindfulness has roots in two fundamental processes of consciousness: attention and awareness (Brown et al., 2007; Chiesa, 2012 In a nutshell, mindfulness is the ability to observe and be aware of the internal and external stimuli of the present moment without judging or interpreting them (Brown & Ryan, 2003; Glomb et al., 2011). According to Brown and Ryan, people with high levels of dispositional mindfulness tend to be perceptive of and receptive to their inner experiences and, therefore, more aware of their behaviour.

Within organisations, high levels of mindfulness have been found to serve as a buffer against employee anxiety, stress, and burnout whilst helping to increase motivation, resilience, job performance and general well-being (Dane & Brummel, 2013; Taylor & Millear, 2016; Johnson et al., 2020). Moreover, dispositional mindfulness may also play a key role in the relationship between interpersonal justice and subsequent engagement in CWB in the context of social exchange theory. As per the social exchange perspective of negative reciprocity, employees who report experiencing unfair treatment, such as low daily interpersonal justice, are likely to respond in a retributory manner, often in the form of CWB. However, empirical evidence suggests that high levels of dispositional mindfulness may reduce these retributive reactions to a perceived lack of justice (Long & Christian, 2015).

Long and Christian argue that high mindfulness moderates the low justice–retaliation relationship by mitigating unsatisfactory reactions to a lack of justice (specifically ruminative and negative thoughts), thus reducing retaliation. This is achieved by both decoupling and the reduction of automaticity. First, by decoupling, mindful individuals are able to detach from one's self, allowing them to view low justice objectively rather than personally, thereby reducing adverse action-oriented and self-protective emotional reactions. The reduction of automation linked to mindfulness decreases negative responses to low justice by defusing the tendency to respond quickly and reactively. Instead, employees are encouraged to perceive a broader range of appropriately regulated responses to the adverse event. Indeed, the value of mindfulness in reducing ruminative and negative thoughts has received considerable empirical support (Brown & Ryan, 2003; Frewen et al., 2007; Raes & Williams, 2010).

Conversely, individuals who exhibit low levels of mindfulness may be more likely to be socially anxious, ruminative and self-conscious, (Brown & Ryan, 2003), thereby making them more likely to engage in CWB as a retaliatory response to low interpersonal justice (Ahmed et al., 2021; Long & Christian, 2015). Taken together, mindfulness may moderate the retaliatory relationship between interpersonal justice and subsequent engagement in CWB-I and CWB-O, as predicted by social exchange theory. That is, employees who exhibit high (vs. low) levels of dispositional mindfulness may be less likely to engage in CWB-I or CWB-O despite reporting low interpersonal justice. As such, we propose the following hypothesis.

> *Hypothesis 5:* Dispositional mindfulness will moderate the negative relationships of interpersonal justice with CWB-I (H5a) and CWB-O (H5b), in that the negative relationships of interpersonal justice with CWB-I and CWB-O will be weaker (vs. stronger) under high (vs. low) dispositional mindfulness.

Method

Participants and Procedure.

A cohort of Master's students from The University of Auckland worked collaboratively to collect data for this study, contributing to a dataset used by all Master's students. Recruitment strategies consisted primarily of advertisements on social media sites such as Facebook and word of mouth. All potential participants were given a participant information sheet and a qualification questionnaire that assessed their eligibility.

The participant information sheet outlined the purpose of the study, project procedures, benefits of participating, assurance of participant confidentiality and privacy, data storage and future use, participant's right to withdraw from the study at any time, potential risks, and the contact information of the researchers. This study's approval from The University of Auckland Human Participants Ethics Committee and reference number (UAHPEC22761) was also included in this sheet.

To be eligible for this study, participants had to be; over 18 years old, worked at least 30 hours per week between 7:00 am - 7:00 pm, Monday to Friday, have had an organisational tenure of at least six months and could not be self-employed. After filtering for eligibility, there were 320 initial participants.

Unfortunately, during our data collection process, New Zealand was moved to Level 4 of the Covid-19 Alert System. This lockdown had significant ramifications on the labour force, with many workers either having to work from home or being unable to work entirely. A staggered data collection process was used to mitigate the effects of the lockdown on our study. Participants were divided into two batches based on their postcodes and started daily diaries after their regions were lifted from strict lockdown.

Batch 1 consisted of 110 people who lived outside of the Auckland region and were invited to participate in this daily diary survey in October 2021. 95% (n=105) of Batch 1

participated in at least some of the daily diary surveys. Batch 2 consisted of the remaining 210 participants who were Auckland residents and thus had experienced prolonged Covid-19 lockdown restrictions. After Covid-19 restrictions had eased in Auckland, Batch 2 participants were contacted by researchers in December 2021 to re-affirm their interest in and eligibility for participation in this study. 157 people responded, 28% of which (n=44) either no longer qualified, were no longer interested in participating, or were duplicates. Researchers invited the remaining 72% (n=113) to participate.

After consenting, all eligible participants were emailed the link to a web-based pre-diary questionnaire conducted through 'Qualtrics'. The pre-diary questionnaire was a one-time general survey that measured demographics, general information about the participant's job and individual differences.

Qualtrics links to web-based daily diaries were emailed to participants in the morning of their work day (11:00 am), near the end of their working day (4:00), and in the evening after work (9:00 pm) every day for five consecutive working days from Monday to Friday. As compensation for their time, participants were given vouchers of up to $60 in value ($10 for completing the baseline survey and an additional $10 voucher per day that all three daily dairy surveys were completed). Of the initial 320 participants, 179 participated in at least some of these daily diary surveys (55.9% response rate).

Data cleaning, involving the deletion of duplicate responses and those identified as outliers using the Mahalanobis distance multivariate outlier detection, left a final sample of 156 participants. 61.4% of the participants were in Batch 1, and the remaining 38.6% were in Batch 2. 135 participants (86.5%) identified as female and 21 (13.5%) as male. The age of participants ranged from 20 to 64 years of age, with a mean age of 38 years old (*SD* = 10.36). Participants were employed in a wide range of industries with the most common being; health care and social assistance (19.9%), education and training (14.1%) and professional,

scientific and technical services (9.6%). The mean organisational tenure of participants was five years (*SD* = 6.1).

The daily diaries were highly structured and used a series of standardised questions shortened and adapted from other scales. The use of web-based questionnaires in this study helped ensure compliance since participants could only complete the surveys at the designated times. The variables of trait neuroticism and dispositional mindfulness were measured in the pre-diary questionnaire survey. Sleep quality and perceived interpersonal justice were measured daily in the 11:00 am survey. Engagement in CWB-I and CWB-O was measured daily in the 4:00 pm afternoon diary survey.

Measures

Neuroticism. Trait neuroticism was measured using four items adapted from the neuroticism dimension of the short form of the Eysenck Personality Questionnaire-Revised (Eysenck & Eysenck, 1984). The four items were: 'I am relaxed most of the time'; 'I seldom feel blue', 'I get upset easily', and 'I have frequent mood swings'. To assess levels of trait neuroticism, participants used a six-point Likert scale to indicate the degree to which each statement applied to them (1 = 'very untrue of me', 6 = 'very true of me). We used six-point Likert scales in assessing individual differences to encourage participants to select an answer that leans either positively or negatively. To score this scale, items 1 and 2 were reverse coded before a mean of the total items was calculated. Higher scores on these items reflected higher levels of trait neuroticism. The Cronbach's alpha reliability of this scale was .76.

Dispositional Mindfulness. The Mindful Attention Awareness Scale (MAAS) by Brown and Ryan (2003) was used to measure the variable of mindfulness. This scale used 15 items to assess a core characteristic of mindfulness by measuring one's tendency to be fully aware of and observant of what is occurring around them. A sample item was: 'I find it difficult to stay focused on what is happening in the present.' Participants used a six-point

Likert scale to indicate how frequently they had each experience (1 = 'almost never', 6 = 'almost always'). The mean of the 15 items was calculated, with higher scores reflecting higher levels of dispositional mindfulness.

Sleep Quality. To measure sleep quality, participants were given the following prompt: 'Please think about the quality of your sleep last night, such as how many hours of sleep you got, how easily you fell asleep, how often you woke up during the night (except to go to the bathroom), whether you woke up earlier than you had to this morning, and how refreshing your sleep was.' Participants were then asked to use a five-point Likert scale to rate the quality of their sleep the night before (1 = 'very bad', 5 = 'very good'). In accordance with the Likert scale, higher scores indicated higher sleep quality the night prior.

Perceived Interpersonal Justice. Three items from the interpersonal justice dimension of the Organisational Justice Scale developed by Colquitt (2001) were used to assess each participant's daily perceptions of interpersonal justice they had experienced in their organisation. The exact items used are as follows; 'My supervisor treated me in a polite manner'; 'My supervisor treated me with respect; and 'My supervisor refrained from improper remarks or comments.' Participants were asked to use a five-point Likert scale to indicate their level of agreement with each of the three statements (1 = 'strongly disagree', 5 = 'strongly agree'). Higher scores in these items reflected higher instances of perceived interpersonal justice. The Cronbach's alpha reliabilities for the perceived interpersonal justice scale are as follows: .84 (Monday); .9 (Tuesday); .9 (Wednesday); .91 (Thursday); .95 (Friday).

Counterproductive Work Behaviour Targeting Individuals (CWB-I). CWB-I was measured using five items adapted from the 45-item CWB-C developed by Dalal et al. (2009). After reflecting on their days' experiences, participants responded on a Yes-No scale to indicate their level of daily engagement with CWB-I. The exact items used in this scale

were; ‘Today, I… Behaved in an unpleasant manner toward my supervisors and/or co-workers', 'Criticised my supervisor and/or co-workers' opinion or suggestion', 'Excluded my supervisor and/or co-workers from a conversation', 'Tried to avoid interacting with my supervisor and/or co-workers and ‘Spoke poorly about my supervisor and/or co-workers to others.' Higher scores reflected higher levels of engagement in CWBI.

Counterproductive Work Behaviour Targeting the Organisation (CWB-O). CWB-O was measured using six items from the CWB-C developed by Dalal et al. (2009). A Yes-No scale required participants to indicate which counterproductive behaviours they had engaged in that day. The items used are as follows; Today I… 'Did not work to the best of my ability, 'Spent time on tasks unrelated to work', 'Criticised organisational policies', 'Took an unnecessary break', 'Worked slower than necessary', 'Spoke poorly about my organisation to others'. Higher scores in this measure indicated higher rates of engagement in CWBO.

Control Variables.

We controlled for the batch of participants, general negative affectivity, and gender in the study. Controlling for the batch of participants recognised that external contextual factors may impact the study variables. Research conducted by New Zealand's Ministry of Social Development found that longer lockdowns increased the likelihood of negative consequences, thus demonstrating how the length of time participants spent in lockdown may confound our results (Anderson et al., 2020). Repercussions include; decreased socio-emotional well-being, worsened employee perceptions of their work-life, and significant declines in specific job-related outcomes such as employee performance (Anderson et al., 2020; Prickett et al., 2020; Tusi et al., 2021). Given the numerous ways that lockdowns have been empirically demonstrated to impact employee well-being and performance and that length of time spent in lockdown exacerbates the effects of lockdown, it was logical to factor in the batch of participants (i.e. those who participated in Oct 2021 or

Dec 2021) as a control variable. For this binary variable, Batch 1 participants who responded in October were coded as 0, and Batch 2 participants who began the data collection process in December were coded as 1.

General negative affectivity (GNA) refers to a general dimension of subjective distress and unpleasant engagement encompassing a wide range of negative mood states. This variable was measured in the pre-diary questionnaire using five items from the Positive and Negative Affect Schedule (PANAS) developed by Watson et al. (1998). Participants were asked to use a five-point Likert scale (1 = 'Never', 5 = 'A great deal') to report the extent to which they felt each of the following items: 'Upset': 'Hostile'; 'Ashamed'; 'Nervous'; and 'Afraid'. Higher scores across these items indicated higher levels of GNA. The Cronbach's alpha reliabilities for the GNA scale are as follows: .83 (Monday); .83 (Tuesday); .87 (Wednesday); .83 (Thursday); .82 (Friday). Utilising GNA as a control variable ensured that the non/significance of findings were caused by variables of interest (namely neuroticism) rather than the potentially confounding variable of GNA.

We also controlled for gender that each participant identified within the general questionnaire. For the present study, the options were; female, male, or gender diverse. Male participants were coded as 0, and female participants were coded as 1. There were no participants in this dataset who identified as gender diverse. Gender was considered as a control variable partly due to the gender-based differences in variables of interest such as CWB (Ng et al., 2016). Perhaps more importantly, gender was unevenly distributed in this study, with 86.5% of participants identifying as female while only 13.5% identified as male.

Analytic Strategy

Descriptive statistics and correlations between key variables were calculated in SPSS. Direct, mediation, and moderation effects were assessed using RStudio. In order to account for the nested nature of our data, direct relationships were assessed with multi-level

regression tests using the 'lme' function in Bliese's (2016) 'multi-level' package. The same function by Bliese was also used to calculate moderation which involved centring the predictor and moderating variables before a linear effects model was conducted. The 'mediation' package by Tingley et al. (2014) and Bates et al.'s (2014) 'lme4' package were used to investigate the mediation effects of interpersonal justice.

The control variables of participant batch, GNA, and gender were trialled to ensure that potential confounding factors did not influence findings. However, neither the batch of participants nor GNA impacted any of the relationships. For our research model to be as parsimonious as possible, we excluded the control variables of GNA and participant batch. Gender, however, was included as a control variable since it was related to sleep quality and CWB.

Supplementary Analyses

While the additional variable of anger was not hypothesized in our research model, its mediating effect on the relationships of sleep with CWB-I and CWB-O was explored in order to provide supplementary insights into the primary relationships of interest. To do so, the 'mediation' (Tingley et al., 2014) and 'lme4' (Bates et al., 2015) packages were used to calculate the mediation effect. Anger refers to the emotion characterised by "tension and hostility arising from frustration, real or imagined injury by another, or perceived injustice" (American Psychological Association, n.d.). A five-point Likert scale (1 = 'Never', 5 = 'All the time') in each of the 4:00 pm daily dairy surveys was used to assess the degree to which extent they experienced each of the following emotions; 1) angry, 2) hostile, 3) irritable. Higher scores across the three items indicated higher levels of daily anger. The Cronbach's alpha reliabilities for the anger scale are as follows: .8 (Monday); .79 (Tuesday); .89 (Wednesday); .84 (Thursday); .78 (Friday).

Results

Descriptive Statistics

Table 1 presents the descriptive statistics and correlations of the key variables in this study. As displayed in the table, trait neuroticism was significantly positively correlated with CWB-I and CWB-O and negatively related to sleep quality. Dispositional mindfulness was positively correlated with sleep quality and interpersonal justice and was negatively correlated with CWB-I and CWB-O. Sleep quality was positively related to interpersonal justice and negatively correlated with CWB-I and CWB-O. High-quality sleep was significantly and negatively related to CWB-I and CWB-O.

Hypotheses Testing

Hypothesis 1 predicted that there would be a positive relationship between sleep quality and perceptions of interpersonal justice. However, Hypothesis 1 was not supported as multi-level modelling revealed that the relationship between sleep quality and interpersonal justice was not statistically significant.

Hypothesis 2 predicted that perceptions of interpersonal justice would be negatively associated with CWB-I (H2a) and CWB-O (H2b). As demonstrated in Table 2, our results partially supported Hypothesis 2 in that there was a significant negative relationship between interpersonal justice and CWB-I (H2a) ($\beta = -.03$, $p = .008$) but not CWB-O (H2b).

Hypothesis 3 predicted that sleep quality would be positively associated with CWB-I (H3a) and CWB-O (H3b) through the mediating variable of interpersonal justice. Multi-level Mediation results showed the mediating effect of interpersonal justice on these relationships was not significant. Therefore, Hypothesis 3 was not supported. Interestingly, Multi-level Modelling did find that sleep quality was significantly, negatively, and directly related to CWB-I ($\beta = -.02$, $p = .02$), while the relationship between sleep quality and engagement in CWB-O was not statistically significant.

Hypothesis 4 predicted that trait neuroticism would moderate the relationship between sleep quality and interpersonal justice. Moderation analysis revealed that trait neuroticism did not significantly moderate the relationship between sleep quality and interpersonal justice. As such, we did not find support for Hypothesis 4.

Hypothesis 5 suggested that dispositional mindfulness would moderate the relationship between interpersonal justice and engagement in CWB-I (H5a) and CWB-O (H5b). However, the results from moderation analysis indicated that dispositional mindfulness did not significantly moderate these relationships. The results from this moderation analysis, therefore, failed to support Hypothesis 5.

Additional Analyses

Given that the majority of hypotheses in this study were not supported, additional analyses were conducted in order to provide supplementary insights and better direction for future research exploring the relationship between sleep quality and subsequent engagement in CWB-I and CWB-O. Monte Carlo results based on 10,000 simulations indicated that daily experiences of anger mediated the effect of sleep quality on subsequent engagement in CWB-I: indirect effect = -.006, 95% CI = [-.01, 0]. 32.1% of the total effect between sleep quality and CWB-I was mediated through anger. Similarly, the Monte Carlo results based on 10,000 simulations also indicated that daily experiences of anger mediated the effect of sleep quality on subsequent engagement in CWB-O: indirect effect = -.005, 95% CI = [-.01, 0] and 34.2% of the total effect between sleep quality and CWB-O was mediated through anger. Anger remained a significant mediator in both of these relationships even after controlling for time of measurement, GNA, and gender.

Discussion

Building on previous sleep and employee behaviour research, this study investigated how sleep quality may predict an employee's participation in CWB and the potential boundary conditions of the relationship between sleep and interpersonal justice on the one hand, and the relationship between interpersonal justice and CWB on the other. Our results showed that sleep quality is significantly related to subsequent CWB-I, demonstrating that employees who report poor sleep the night prior are more likely to engage in CWB-I the following day. However, contrary to our hypothesis, interpersonal justice did not significantly mediate this relationship between sleep and CWB-I, thereby indicating that sleep quality may predict CWB-I through mediators not hypothesized in this study.

Anger was explored as an additional variable due to its significant mediating role in similar relationships. Research by Christian and Ellis (2011) found that hostility (including anger) significantly mediates the effect of poor quality of sleep on workplace deviance. It is worth noting that despite their similarities, CWB and workplace deviance are distinct constructs due to fundamental differences in their measures and some antecedents (e.g. gender was found to be a significant predictor of workplace deviance but not CWB) (Thrasher et al., 2020). To explain the role of anger in this relationship, a self-regulatory resource perspective was applied. According to this approach, self-regulation is contingent on a global, but finite, pool of resources that can be temporarily reduced by situational demands, such as inadequate sleep (Baumeister et al., 1994). As highlighted by Christian and Ellis, when self-regulatory efforts fail, negative behaviours that would otherwise be inhibited (i.e., workplace deviance) are more likely to occur.

Multi-level modelling showed that daily anger significantly mediated the relationship between sleep quality and subsequent CWB-I. These supplementary findings suggest that

poor sleep quality may increase an employee's propensity to experience anger, thus making them more likely to engage in CWB-I.

Interestingly, despite finding a significant relationship between sleep quality and CWB-I, sleep quality was not significantly related to CWB-O. The significant negative relationship between sleep quality and CWB-I, but not CWB-O shows that despite their similarities, these two dimensions of CWB are distinct, and must be treated as such.

Given that sleep quality was not significantly related to interpersonal justice, interpersonal justice was not a significant mediator in the relationship between sleep and CWB per Baron and Kenny (1986).

That non-significant relationship between sleep quality and interpersonal justice may be due to the low standard deviation of the interpersonal justice variable and its high mean. These statistics indicate that a significant number of participants reported high levels of interpersonal justice daily. Indeed, 25% of participants selected the highest possible score for interpersonal justice, suggesting the occurrence of the ceiling effect (Garin, 2014).

The low variability in the data gathered on interpersonal justice perceptions may have led to reduced statistical power, thus increasing the potential for Type I error (Austin & Brunner, 2003). As stated by Banerjee et al. (2009), the likelihood of a study detecting an association between a predictor variable and an outcome variable is, of course, dependent on the magnitude of that relationship in actuality. Since low-powered studies may only detect large effects, it is possible that the relationship between interpersonal justice and CWB-I was significant despite the low standard deviation of interpersonal justice simply because this relationship is greatly significant, and therefore more resistant to type II error.

While it is by no means novel, the finding that interpersonal justice was negatively related to CWB-I but not to CWB-O serves to further show the importance of treating the two dimensions of CWB as distinct constructs. Indeed, the agent–system model of justice, which

is founded on SET principles, posits that individuals will typically direct their behavioural response toward the origin of their unjust treatment (Jones, 2009). Supporting this model of justice, Hershcovis et al. (2007) reported that workplace outcomes are often target-specific, with organisational factors (e.g., situational constraints, and job dissatisfaction) typically predicting organization-specific outcomes, whereas interpersonal factors such as interpersonal conflict are the strongest predictors of interpersonal outcomes. Therefore, the partial support for Hypothesis 2 is consistent with social exchange literature since the interpersonal nature of CWB-I means that this more targeted form of retribution against interpersonal justice compared to CWB-O.

In terms of the moderators, empirical evidence (e.g., Serfass & Sherman, 2013) suggested that trait neuroticism may moderate the relationship between sleep quality and interpersonal justice. However, results from our study did not support this hypothesis. Similarly, while we hypothesised that dispositional mindfulness would moderate the relations between interpersonal justice and CWB by reducing retributory responses to low justice (Long & Christian, 2015), our findings showed that this moderation effect was not statistically significant. Although the file-drawer effect and publication bias have perpetuated to the myth that "null findings" are of no value, scholars assert that non-significant results have the potential to be equally as informative as significant ones (Antonakis, 2017; Mehler et al., 2019). For example, our non-significant findings show a discrepancy between the current study's findings and those of previous research. This disparity is of particular interest in the context of the ongoing Covid-19 pandemic as it may signify a potential confounding effect of the pandemic on organisational research (Alsiri et al., 2021).

Theoretical Implications

The results of this study indicate that an employee's quality of sleep may be an important predictor of their engagement in CWB-I, with employees who report poor sleep

quality being more likely to engage in CWB-I the following day. To date, there has been remarkably little research directly examining the relationship between sleep and CWB. Existing research investigating sleep and CWB differs from this study in that it treats poor sleep as a result of CWB rather than being its predictor. For example, Yuan et al. (2018) found that CWB are positively associated with insomnia through the mediating effects of moral deficits and rumination, as employees who engaged in CWB throughout their workday were more likely to have difficulty sleeping that evening. By identifying the substantial role that sleep quality plays in predicting employee engagement in CWB-I, this study extends beyond the unilateral perspective provided by previous research. In light of previous research and our current findings, we suggest that the relationship between sleep and counterproductive behaviours may be bi-directional, with CWB being both a cause and consequence of poor sleep. This bi-directional relationship indicates the potential for a vicious, self-perpetuating cycle where, after experiencing a night of poor sleep, employees may engage in CWB-I the following day, which may then negatively impact their sleep that evening.

Furthermore, by exploring the unique influence of inadequate sleep on CWB-I but not CWB-O, our study further refines the existing understanding of the relationship between inadequate sleep and undesirable behaviours in the workplace. Previous research studying the relationship between CWB and sleep has adopted a more general perspective of CWB. Overlooking the different facets of CWB means that previous research has not specified exactly how sleep-deprived employees may act counterproductively in the workplace. Our findings suggest that poor sleep is more likely to result in CWB-I rather than CWB-O and refine the current understanding of the relationship between sleep and CWB.

This study further contributes to the existing sleep and organisational literature by analysing the value of interpersonal justice perceptions in explaining why the relationship

between sleep quality and CWB-I may exist. Although SET is an influential theory within organisational literature, our application of this framework was a novel approach to understanding the relationship between sleep quality and subsequent employee behaviour. Despite theoretical and empirical support, our results did not support interpersonal justice as a mediator in the relationships between sleep and CWB. As such, this study contributes to current organisational literature by indicating that SET is not an appropriate theoretical lens to examine the relationships between sleep and employee behaviour via interpersonal justice.

Supplementary analyses did, however, find that daily anger significantly mediates the relationship between sleep quality and CWB-I. This mediation effect corresponds with previous research regarding sleep and undesirable employee behaviours, such as that by Christian and Ellis (2011). The significant impact anger has as a mediating variable between sleep and CWB-I implies that poor sleep and increased negative emotions negatively influence employee behaviour at both a general (workplace deviance) and a more specific (CWB-I) level.

Practical Implications

In addition to the previously discussed theoretical implications, our findings also make important practical contributions. Since the antecedents of undesirable behaviour must be addressed for them to be reduced effectively (Miltenberger, 2004), an awareness of the range of factors that contribute to issues, such as CWB, is vital for organisations. Finding that employee sleep quality is a significant predictor of CWB-I, our study suggests that in order to reduce CWB, organisations must foster a culture and environment that values sleep.

Redesigning jobs by restricting overtime and minimising shift work to reduce stressful conditions and long hours is a logical and straightforward approach to improving employees' sleep and is one with strong empirical support (Åkerstedt & Wright, 2009; Boivin & Boudreau, 2014). However, this approach may not be feasible for all workplaces where

factors such as shift work are inherently required. In these situations, other strategies such as implementing workplace healthy sleep programs may be better suited for promoting better sleep among employees (Robbins et al., 2019; Steffen et al., 2015). Healthy sleep programs typically consist of sleep hygiene, meditation, and relaxation techniques or cognitive behavioural therapy for insomnia (CBT-I).

Establishing policies that restrict work-related communication outside work hours may be another effective way to minimise CWB-I since organisational cultures that normalise constant connectivity have consistently been found to jeopardise employee sleep (Boswell et al., 2016; Büchler et al., 2020). Constant connectivity is shown to harm employee sleep as it impedes daily recovery from work by blurring the boundaries between work and home. This has the effect of preventing psychological disengagement from work during leisure time (Sonnentag et al., 2008; Sonnentag, 2012).

Limitations and Future Directions

As with any study, there are several limitations to consider when interpreting our findings. Due to the self-reported nature of our data, this study's first limitation is its potential for common method variance (CMV). CMV refers to the variance attributed to measurement techniques rather than the constructs that the measures should reflect, potentially resulting in an inflated or deflated relationship between two constructs (Chang et al., 2010; Podsakoff et al., 2003). CMV may therefore lead to Type I and Type II errors. According to Podsakoff and colleagues, the temporal separation of variables of interest is a critical procedural strategy to control CMV when it is not possible to collect data from different sources. Indeed, this study's use of daily diary surveys allowed for the temporal separation of variables of interest by measuring variables at different times, supporting the legitimacy of our findings.

It is also worth noting that subjective self-report measures rely on participants' recollections, which may lead to recall bias. However, the daily diary nature of our study

meant that participants were only asked to respond to questions regarding very recent interactions and experiences. We, therefore, feel confident in our participants' ability to report their recent experiences accurately. Despite potential limitations, self-reporting was the most effective data collection method for this study since most variables within our research model measured personality facets or an individual's perception of a situation. The private nature of these variables means that it would be difficult, if not impossible, for others to assess or report, rendering alternative reporting measures inadequate (Paulhus & Vazire, 2007).

Using a single-item measure to assess sleep quality is another significant limitation of the present study. Single-item measures are not ideal, partially because the internal reliability of single items cannot be estimated (Wanous & Huday, 2001). Additionally, Hoeppner et al. (2011) state that single-item measures are also more susceptible to measurement errors, which are more likely to be mitigated with multiple items, and are more likely to be misinterpreted. In contrast, multi-item measures have more robust psychometric properties and are also better at capturing the full extent of a construct.

Nevertheless, despite their limitations, single-item measures do offer unique advantages that may benefit our study. Due to their brevity and simplicity, single-item measures are faster and less monotonous for participants and, as such, are less demanding than multiple-item measures. The value of this is evidenced by Crawford et al. (2001), who found that perceived burden directly impacts attrition rates. As such, using single-item measures in daily-diary studies has definite advantages. While a single-item measure for sleep was appropriate for the present study to reduce participant burden, future research may consider using multiple-item sleep measures. Such items, like the Sleep Quality Scale developed by Yi et al. (2006), may better ensure internal consistency and provide deeper insight into participants' sleep quality.

Despite attempts to reduce participant burden, high drop-out rates were still an issue for the present study as only 48.8% of initial participants completed the whole data collection.

Since daily diary studies are notorious for significant participant drop-out, this was something we accounted for early in the data collection process by purposefully recruiting a large initial sample of participants. Ohly et al. (2010) suggest that daily diary studies should ideally have over 100 participants completing daily diaries for approximately five working days to ensure the generalizability and significance of findings. Therefore, despite drop-out rates, this study still had an adequate number of participants and can be considered sufficiently powered.

The use of convenience sampling to recruit participants is another limitation of this study is, as it means that our sample was not fully representative of the general population, which may impact the external validity of our findings (Andrade, 2021). Indicating that our sample was not representative of the general population was the disproportionate number of female and male participants. This convenience sampling may have also led to a self-selection bias (Bethlehem, 2010). As is the case in any empirical research, studying the entire population would have been ideal; however, this was not a viable option due to limited time and resources. Despite its constraints, convenience sampling was a cheap and efficient recruitment method that allowed us to contact a large number of prospective participants with our limited resources. Given the previously discussed issues with drop-out rates in daily diary studies and our aim to mitigate its consequences, this recruitment method was integral to obtaining a significant number of initial participants.

The present study is also unable to draw any causal conclusions regarding the relationships examined. Because this study used observational research methods that were not manipulated or controlled, we cannot definitively conclude that poor sleep *causes* higher CWB-I, despite finding that sleep quality is significantly related to later engagement in CWB-I. Building on our findings, future research investigating the relationship between sleep and CWB may consider using experimental designs, which are the most straightforward approach to determining whether there is a causal relationship between variables of interest

(Holland, 1986). Interventions, such as healthy sleep programs, may assess whether promoting better sleep among employees will reduce their engagement in CWB, particularly CWB-I, thus allowing causal conclusions.

New Zealand's 2021 lockdown in response to the ongoing Covid-19 pandemic is an exogenous factor that has likely had serious repercussions for the present study (Alsiri et al., 2021). While a comprehensive analysis of the effects of the Covid-19 lockdown on our study is beyond the scope of this paper, there are clear signs of its influence on our findings.

Although implementing a staggered approach to data collection meant that participants were not surveyed while in strict lockdown conditions, working virtually from home has continued even after the easing of restrictions (Green et al., 2020). This has likely had significant ramifications for the present study (Alsiri et al., 2021). The ceiling effect observed within the interpersonal justice variable may be attributable to the widespread shift to working from home in response to Covid-19. Indeed, Okdie et al. (2011) found that when interacting online rather than face-to-face, individuals are more self-aware of their treatment of others. As such, the working-from-home mode likely increased supervisor self-awareness of their treatment of employees. This self-awareness is shown to increase interpersonal justice within the workplace (Whiteside & Barclay, 2014).

The potential confounding effect of Covid-19 lockdowns is similarly found in other key variables in our research study, such as neuroticism. Rice and Markey (2009) found that neurotic participants tended to be less anxious following a virtual interaction than one that is face-to-face. A reduction in anxiety is likely to positively influence neurotic employees' interpersonal justice perceptions despite poor sleep quality, with them being more likely to report high interpersonal justice (West, 2011). Therefore, it is plausible that the increase in remote working may have 'levelled the playing field' for neurotic employees, which explains

why trait neuroticism did not moderate the relationship between sleep quality and perceived interpersonal justice.

While inferences can be drawn from previous studies, further research is required to better comprehend the workplace repercussions of the recent shift to remote working in response to Covid-19. Examination of working from home as a boundary condition shows promise as a way to develop this understanding.

As such, we encourage future research to explore how working from home may moderate key relationships of interest in order to better understand how the societal shifts caused by Covid-19 alter the workplaces and employee behaviours. These insights are important for organisational literature in that it will help to ensure that academic understanding continues to align with reality.

Finally, through the application of the social exchange theory, the current study took the first step in understanding the relationship between sleep quality and CWB-I. The non-significant mediating effect of interpersonal justice failed to support the use of SET as a theoretical foundation for this relationship. Given that poor sleep was positively associated with engagement in CWB-I, further investigation using other theoretical frameworks that may better explain this relationship is required. Providing some direction for this research was shown in the supplementary analyses, which found that anger significantly mediated the relationship between sleep quality and CWB-I. Our finding corroborated previous research which showed that anger mediated the relationships between sleep and employee deviance, supporting the utilisation of self-regulatory resource theories (Christian & Ellis, 2011). More broadly, our results highlight the importance of emotions in determining employee behaviour. We, therefore, encourage future studies to extend these findings in order to allow for greater insights into why and how sleep quality impacts employee behaviour.

Conclusion

Through the implementation of daily diary studies, our results show that poor quality of sleep may significantly increase an employee's likelihood of engaging in CWB-I the following day. Furthermore, while our initial hypotheses were not supported, we do find that anger may mediate the relationship between sleep and CWB-I. We hope that our paper inspires more scholarly attention to the organisational consequences of poor sleep quality, leading to a greater understanding of employee wellbeing for positive organisational outcomes. Additionally, through the significant disparities between previous research and our results, we also highlight the importance that future studies consider the influence of the ongoing Covid-19 pandemic. In doing so, researchers can ensure that academic understandings of organisational behaviour keep up with the rapidly changing world of work.

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Table 1. *Correlations and Descriptive Statistics of all Variables*

Variable	N	*M*	*SD*	1	2	3	4	5	6
Within-Person Level									
1. CWBI	600	0.13	.21	-					
2. CWBO	600	0.23	.24	.34**	-				
3. Sleep quality	596	3.33	1.09	-.14**	-.09*	-			
4. Interpersonal Justice	593	4.03	.82	-.34**	-.17**	.09*	-		
Between-Person Level									
5. Neuroticism	156	3.96	1.2	.1*	.11**	-.18**	-.04	-	
6. Mindfulness	156	4.35	1.12	-.16**	-.11*	.14**	.09*	-.54**	-

*Note. CWB-I = Counterproductive work behaviours targeting individuals: CWB-O = Counterproductive work behaviours targeting organisations. M and SD are used to represent mean and standard deviation, respectively. *p < .05. **p < .01.*

Table 2. *Moderation Mediation Results*

	Interpersonal Justice		CWB-I		CWB-O	
Variable	b	SE	b	SE	b	SE
Intercept	3.1***	.3	.17*	.08	.28**	.09
Within-Person Variables						
Gender	.41**	.14	-.06	.08	-.05	.04
Sleep Quality	.04	.03	-.02*	.01	-.01	.01
Interpersonal Justice	-	-	-.03**		.01	.01
Between-Person Variable						
Neuroticism	-.06	.04	-	-	-	-
Mindfulness	.76	.04	-.03*	.01	-.02	.01
Cross-level Interaction						
Sleep X Neuroticism	-.04	.02	-	-	-	-
Interpersonal Justice X Mindfulness	-	-	.00	.01	-.01	.01

*Note. N = 156 at Level 2, n = 593 – 600 at level 1. CWB-I = Counterproductive work behaviours targeting individuals: CWB-O = Counterproductive work behaviours targeting organisations. b = unstandardized coefficient, SE = standard error of unstandardized coefficient. *** p <.001, ** p < .01, * p < .05*

Table 3

Results for Supplementary Direct Effects.

Variable	Anger		CWB-I		CWB-O	
	b	*SE*	*b*	*SE*	*b*	*SE*
Intercept	2.31***	0.33	.17*	.08	.28**	.09
Gender	-.09	.16	-.06	.08	-.05	.04
Sleep Quality	-.09**	.03	-.02*	.01	-.01	.01
Anger	-	-	.06***	.01	.05**	.01

*Note. N = 156 at Level 2, n = 593 – 600 at level 1. CWB-I = Counterproductive work behaviours targeting individuals: CWB-O = Counterproductive work behaviours targeting organisations. b = unstandardized coefficient, SE = standard error of unstandardized coefficient, t = t-test statistic. *** p <.001, ** p < .01, * p < .05*

Appendix A
Qualification Questions

Thank you for your interest. Please complete below qualification questions.

1. What is your age? _____

2. Does your work fall on Monday-Friday?
   - Yes
   - No

3. Do your working hours fall in between 7 a.m. and 7 p.m.?
   - Yes
   - No

4. How many hours do you work in a typical week? _____

5. How long have you been a member of your current organization? _____years____months

If you would like to participate, please enter your email address below, the pre-diary questionnaire will then be sent to you via your email address:

_____

Thank you so much.

Appendix B

Items Used Within the Present Study

Baseline Survey Items

Neuroticism

Below is a list of statements dealing with your general feelings about YOURSELF. Please choose the response that best represents how accurately each statement describes you.	Very Inaccurate						Very Accurate
I am relaxed most of the time.	1	2	3	4	5	6	7
I seldom feel blue.	1	2	3	4	5	6	7
I get upset easily.	1	2	3	4	5	6	7
I have frequent mood swings.	1	2	3	4	5	6	7

Mindfulness

Please indicate how frequently you have the experience described in each statement.	Almost never					Almost always
I could be experiencing some emotion and not be conscious of it until some time later.	1	2	3	4	5	6
I break or spill things because of carelessness, not paying attention, or thinking of something else.	1	2	3	4	5	6
I find it difficult to stay focused on what's happening in the present.	1	2	3	4	5	6
I tend to walk quickly to get where I'm going without paying attention to what I experience along the way.	1	2	3	4	5	6
I tend not to notice feelings of physical tension or discomfort until they really grab my attention.	1	2	3	4	5	6
I forget a person's name almost as soon as I've been told it for the first time.	1	2	3	4	5	6
It seems I am "running on automatic" without much awareness of what I'm doing.	1	2	3	4	5	6
I rush through activities without being really attentive to them.	1	2	3	4	5	6
I get so focused on the goal I want to achieve that I lose touch with what I am doing right now to get there.	1	2	3	4	5	6
I do jobs or tasks automatically, without being aware of what I'm doing.	1	2	3	4	5	6
I find myself listening to someone with one ear, doing something else at the same time.	1	2	3	4	5	6

I drive places on "automatic pilot" and then wonder why I went there.	1	2	3	4	5	6
I find myself preoccupied with the future or the past.	1	2	3	4	5	6
I find myself doing things without paying attention.	1	2	3	4	5	6
I snack without being aware that I'm eating.	1	2	3	4	5	6

Morning (11 am) Survey Items

Sleep

Please think about the quality of your sleep last night, such as how many hours of sleep you got, how easily you fell asleep, how often you woke up during the night (except to go to the bathroom), how often you woke up earlier than you had to this morning, and how refreshing your sleep was. (1=very bad; 5 =very good)

- How would you rate the quality of your sleep last night?

Interpersonal Justice

Based on **this morning's** experience, please indicate your level of agreement with each of the following statements. This morning….	Not at all				To a large extent
my supervisor treated me in a polite manner.	1	2	3	4	5
my supervisor treated me with respect.	1	2	3	4	5
my supervisor refrained from improper remarks or comments.	1	2	3	4	5

Afternoon (4 pm) Survey Items

CWB

(CWB-I = 1 - 6; CWB-O = 7 - 11)

Based on your today's experiences, select the proper response to each of the following statements

Today, I ….

1.	Behaved in an unpleasant manner toward my supervisors and/or coworkers.	Yes	No
2.	Tried to harm my supervisor and/or coworkers.	Yes	No
3.	Criticized my supervisor and/or coworkers' opinion or suggestion.	Yes	No
4.	Excluded my supervisor and/or coworkers from a conversation.	Yes	No
5.	Tried to avoid interacting with my supervisor and/or coworkers.	Yes	No
6.	Spoke poorly about my supervisor and/or coworkers to others.	Yes	No
7.	Did not work to the best of my ability.	Yes	No
8.	Spent time on tasks unrelated to work.	Yes	No
9.	Criticized organizational policies.	Yes	No
10.	Took an unnecessary break.	Yes	No
11.	Worked slower than necessary.	Yes	No
12.	Spoke poorly about my organization to others.	Yes	No

Anger

This scale consists of a number of words that describe feelings and emotions. Thinking about yourself and how you feel **today**, to what extent do you generally feel: **I feel**:	Never	Rarely	Occasionally	A moderate amount	All the time
angry	□	□	□	□	□
hostile	□	□	□	□	□
irritable	□	□	□	□	□