A Two-Study Investigation into the Link Between Rumination and Night Eating, and Symptom Improvement Following a Mindfulness-Based Intervention

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Ph.D. Clinical Psychology Dissertation

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08 January 2021

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Abstract

Night eating syndrome (NES) is characterized by a circadian delay in eating and nocturnal awakenings with ingestions. Its onset is related to stress and the syndrome is linked to depressed mood, anxiety, sleep problems, and obesity. Among patients with clinical depression, night eaters report greater rumination than non-night eaters. The objective of Part A of this study was to investigate whether a link between rumination and NES severity exists in a nonclinical sample of students after accounting for severity of depression symptoms. Several online self-report measures were completed by 713 students (mean age = 20.72 years, *SD* = 4.76). Night eaters (*n* = 47) reported higher levels of perceived stress, rumination, depression symptoms, trait and state anxiety, and poorer sleep quality than non-night eaters (*n* = 666). NES severity explained a small but significant portion of variance in rumination after accounting for depression symptoms. The objective in Part B was to examine the effectiveness of a novel mindfulness-based intervention (MBI) for the treatment of NES using a single blind parallel design. Night eaters (*N* = 17; mean age = 24.18 years, *SD* = 6.20) participated in a four-week MBI in which eight were randomly assigned to the MBI group and nine to the waitlist control group using a simple 1:1 allocation ratio. Following the intervention, the MBI group reported a significant decrease in NES severity, rumination, and perceived stress. However, over the same period of time, the waitlist group also reported decreases in these variables. Although no statistical significance was found when comparing both groups in the amount of change they experienced, an examination of effect sizes showed that the MBI increased night eaters' mindfulness (large effect size; no change in waitlist), improved their sleep quality (medium effect size; worse sleep quality in waitlist), and

decreased depression symptom severity (small effect size; larger decrease in MBI group), which is suggestive of clinically significant improvement. Overall, the MBI was successful in increasing mindfulness but did not affect rumination. As such, rumination was not found to explain any benefits following the MBI. It appears that it is largely the presence of depression symptoms that explains the relationship between NES severity and rumination, suggesting that night eaters with co-morbid depression may be at increased risk of psychopathology. Mindfulness, however, may be a promising intervention for improving depression symptoms among night eaters.

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Introduction

Night eating syndrome (NES) was first described over 60 years ago and is characterized by a circadian delay in eating (Stunkard et al., 1955). Night eaters experience a lack of appetite in the morning and consume a significant amount of their calories in the evening and nighttime (Birketvedt et al., 1999). The pattern of eating reflects a shift in the timing of food consumption but not necessarily an increase in total caloric intake (Allison, Ahima et al., 2005; O'Reardon, Ringel et al., 2004). Some night eaters experience depressed mood at night, have trouble falling or staying asleep, and may engage in nocturnal ingestions whereby they wake during sleep to ingest food (Birketvedt et al., 1999). Individuals with an evening chronotype have a circadian preference for activity and alertness in the evening (Horne & Östberg, 1976). Recently, an association between NES and evening chronotype was found, suggesting that NES reflects a circadian delay, not only in food intake, but in entire functioning (Riccobono et al., 2020). However, most researchers argue that individuals with NES have a circadian delay only in their eating without affecting their global functioning (i.e., they have sleep onset and offset times comparable to controls; Goel et al., 2009; O'Reardon, Ringel et al., 2004; Rogers et al., 2006).

The prevalence of NES ranges from 1.1% to 6.6% in the general population (de Zwaan, et al., 2014; Malesza, 2020; Rand et al., 1997; Striegel-Moore et al., 2005; 2006; Stunkard, 2002), 1.2% to 15% among students (Ahmed et al., 2019; Borges et al., 2017; Elsadek et al., 2014; He et al., 2018, 2019; Meule et al., 2014a, 2014b; Nolan & Geliebter, 2012, 2016; Öner et al., 2018; Riccobono et al., 2020; Runfola et al., 2014; Sevincer et al., 2016; Yahia et al., 2017), and 12.3% to 25% among those with a psychiatric diagnosis (Lundgren, Allison, Crow, et al. 2006; Lundgren et al., 2010). NES is also 5.2 times more likely to occur among patients with obesity than those without (Lundgren, Allison, Crow, et al. 2006). NES prevalence rates among

class I and class II obesity groups are 22.7% and 24.6%, respectively (Kara et al., 2020). It is estimated that 6% to 16% of patients in weight reduction programs, and 8% to 42% of candidates for bariatric surgery have NES (Stunkard et al., 2008).

Those with NES are 4.9 times more likely than controls to have a first-degree biological relative also living with NES (Lundgren et al., 2006) which suggests that there may be a genetic component to the syndrome. Similar prevalence rates are found in both sexes (e.g., Sevincer et al., 2016), although some studies suggest that night eating is more prevalent among males than among females (Ahmed et al., 2019; Aronoff et al., 2001; Colles et al., 2007; Grilo & Masheb, 2004; He et al., 2018; Orhan et al., 2011; Striegel-Moore et al., 2006, 2008; Tholin et al., 2009). Age of onset is typically in early adulthood and the course tends to be chronic with periods of symptom remission and exacerbation related to stress (Vander Wal, 2012).

NES Defined

The definition of NES has varied over the years and become less restrictive (see Striegel-Moore, Franko, May, et al., 2006 for review). Nonetheless, the defining feature of NES remains a marked circadian delay in food intake (O'Reardon, Ringel et al., 2004), as specified by eating during the evening or night and the proportion of food consumed relative to the rest of the day.

At its simplest, NES is defined as a symptom (i.e., as night eating), consisting of evening eating and/or nocturnal ingestions. The former refers to the consumption of at least 25% of daily caloric intake after the evening meal and the latter refers to the act of waking from sleep to eat during the night. In other words, *evening eating* involves eating after dinner and prior to falling asleep while *nocturnal eating* involves eating that occurs after an arousal from sleep and prior to one's final awakening in the morning; both terms are included under the umbrella term of night eating (Howell & Crow, 2012). The distinction between the two, however, is important because

there is evidence to indicate that nocturnal eating is associated with greater psychological distress compared to evening eating (Colles et al., 2007) and therefore might represent a more severe form of night eating.

According to research diagnostic criteria (Allison, Lundgren, O'Reardon et al., 2010), NES as a syndrome consists of the consumption of at least 25% of daily caloric intake after the evening meal (i.e., evening hyperphagia) and/or nocturnal ingestions, plus additional symptoms that include a lack of desire to eat in the morning and/or skipping breakfast (referred to as morning anorexia), a strong urge to eat between dinner and sleep onset and/or during the night, presence of sleep onset and/or sleep maintenance insomnia, a belief that one must eat in order to initiate or return to sleep, and depressed mood that often worsens in the evening. Individuals must be aware of their nocturnal ingestions, they must experience distress and/or impairment, and they must have experienced these symptoms for a minimum of three months. Distress or impairment in functioning may be reflected in shame or guilt over night eating, distress about weight gain, and/or daytime sleepiness. Lastly, the syndrome is not secondary to substance abuse, a medical disorder, medication, or another psychiatric disorder.

NES is included in the fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5; American Psychiatric Association, 2013) under *Other Specified Feeding and Eating Disorders*. This category applies to presentations in which symptoms characteristic of a feeding and eating disorder are present but do not meet the full criteria for any of the disorders listed in that diagnostic class. The DSM-5 offers only a brief description of what the syndrome is and is not, but does not provide diagnostic criteria or acknowledge that researchers (e.g., Goel et al., 2009; Lundgren et al., 2012; O'Reardon, Ringel et al., 2004) have conceptualized NES as a circadian disorder (see Appendix A for DSM-5 description of NES).

Distinction from Other Disorders

There are a few disorders that share similar features with, but are distinct from, NES. These include eating disorders such as binge eating disorder (BED), bulimia nervosa (BN), and anorexia nervosa (AN), as well as the parasomnia known as sleep-related eating disorder (SRED).

NES can be differentiated from BED, BN, and AN by the nature and timing of food ingestions as well as by the associated clinical features (Vander Wal, 2012). Individuals with NES are more likely to engage in food intake during nocturnal awakenings than are persons with BED (Allison et al., 2005) or BN (Lundgren et al., 2011). As well, NES does not appear to be a variant of BED in which the binges occur exclusively in the evening after dinner or during nocturnal awakenings (Allison et al., 2005). The number of calories ingested by individuals with NES during food intake tends to be smaller, averaging about 779.1 kcal from 8 P.M. to 8 A.M. (Allison, Ahima et al., 2005) and 271 kcal during nocturnal ingestions (Birketvedt et al., 1999), whereas binges normally involve larger ingestions ranging from 1200 to 1400 kcal per episode (Rosen et al., 1986; Rossiter & Agras, 1990).

Insomnia is indicative of NES but is not considered a component of other eating disorders (Stunkard et al., 1955). Also, in contrast to other eating disorders, night eating does not involve the same degree of preoccupation with food, dieting, and body weight and shape concerns (Adami et al., 1999; Allison, Grilo, et al., 2005). Restrained eating and compensatory behaviours also do not appear to play a role in NES. Although it could be argued that morning anorexia reflects an intentional effort to restrict food intake to compensate for night eating, most researchers agree that morning anorexia reflects a circadian delay in the timing of food intake.

Another difference relates to alexithymia, which is a personality trait characterized by the

inability to identify and describe one's emotions (Nemiah, 1976). Literature suggests that difficulty distinguishing emotions from bodily sensations is common in BED and leads to bingeing due to confusion between emotional arousal and physical hunger (Carano et al., 2006). However, alexithymia is not related to the severity of NES (Vinai et al., 2015), which serves as useful distinction from other eating disorders, especially BED. The two appear to be distinct syndromes with different psychopathological pathways.

The stipulation that night eaters be aware of their nocturnal ingestion(s) differentiates NES from SRED (Vinai et al., 2012). SRED is a parasomnia that is characterized by recurrent episodes of nocturnal eating during a reduced state of alertness occurring after sleep onset (American Academy of Sleep Medicine, 2005). Individuals with NES, however, are aware and have good recall of their nocturnal eating episodes whereas individuals with SRED have little or no awareness (Anderson et al., 2012). In NES, the type of food ingested during nocturnal eating episodes are typical foods that are eaten during the day (e.g., cookies or sandwiches) whereas in SRED, strange or even inedible items (e.g., raw meat or cigarettes) are consumed during the individual's reduced state of alertness (Howell et al., 2009). Another distinction relates to the timing of food intake. NES represents an abnormality in the circadian rhythm of eating with normal circadian timing of sleep onset, whereas with SRED, the problematic eating episodes occur only after arousal from sleep (Howell et al., 2009). Finally, sleep-related injuries or occurrence of dangerous behaviours in search of food is unlikely in NES but quite common in SRED (American Academy of Sleep Medicine, 2005).

Etiology

The etiology of NES is widely viewed to be circadian in nature (Goel et al., 2009; Lundgren, Boston et al., 2012; O'Reardon, Ringel, et al., 2004). Similar to how circadian

rhythm sleep disorders are attributed to a misalignment between the timing of sleep and the 24-hour social and physical environment (Barion & Zee, 2007), NES is thought to reflect a misalignment between the timing of eating and the 24-hour social and physical environment (Lundgren, Boston et al., 2012). Food and light affect circadian rhythm by means of food-entrained oscillators (FEO) and light-entrained oscillators (LEO). Normally FEO and LEO cues are synchronized which results in corresponding behavioural and physiological processes (e.g., most individuals fast while asleep at night and only eat during the day while awake). However, FEOs and LEOs can become desynchronized so that eating behaviour does not take place during the normal light-dark and sleep-wake circadian cycles, resulting in a circadian rhythm shift similar to that seen in NES. Although the majority of circadian rhythm research has been done with animals, it may be possible that FEOs in humans can re-entrain eating behaviour during the night while still maintaining a stable sleep-wake circadian rhythm. This re-entrainment of eating during the dark-sleep phase in humans could theoretically shift hormonal and neuroendocrine rhythm, which would physiologically reinforce the eating behaviour at an abnormal time (Lundgren, Boston et al., 2012).

Although it is not entirely clear what causes or maintains the circadian shift in eating behaviour that characterizes NES, research has focused on serotonin and certain appetite- and sleep-related hormones (Ungredda et al., 2012). Based on the literature, Stunkard and colleagues (2009) proposed a biobehavioural model of NES. According to the model, an interaction of stress and genetic vulnerability elevates serotonin transporter (SERT) levels in the midbrain, leading to increased reuptake of serotonin. In support of the model, SERT binding is increased in the midbrain of individuals with NES (Lundgren, Newberg et al., 2008), even compared to those with major depressive disorder (MDD; Lundgren et al., 2009). It is hypothesized that the

resulting decrease in serotonin leads to a circadian delay and decreased feelings of fullness (Stunkard et al., 2009). Additional evidence for the biobehavioural model of NES comes from the restoration of circadian rhythm and satiety following administration of selective serotonin reuptake inhibitors (SSRIs), which decrease SERT (Frazer, 2001) and increase postsynaptic serotonin. Results from these studies indicate that the serotonin system is involved in the pathophysiology of NES, and that NES and MDD are distinct clinical syndromes.

Aside from the involvement of serotonin, certain appetite-related hormones may be implicated in the etiology of NES. Ghrelin and leptin are hormones secreted in the gastrointestinal tract; the former increases hunger and the ingestion of food and the latter increases feelings of satiety and suppresses appetite. The circadian rhythm of both in night eaters is phase delayed (Goel et al., 2009) resulting in both delayed feelings of hunger and satiety, which might account for the delayed food intake.

Lastly melatonin, a naturally occurring hormone that increases at night and induces sleep, is significantly lower in night eaters during the sleeping phase of the sleep-wake cycle (from 10 P.M. to 6 A.M.; Birketvedt et al., 1999). The diminished levels of melatonin might contribute to sleep maintenance insomnia seen in some night eaters, in particular nocturnal eaters. Given that nocturnal eaters tend to consume foods that have high carbohydrate to protein ratios (Birketvedt et al., 1999) it has been postulated that nocturnal eating serves to restore sleep as these foods increase the synthesis of tryptophan which induces sleepiness (Spring et al., 1987).

Assessment

Assessment of night eating requires the evaluation of two distinct aspects of eating – the quantity of food and the timing of food intake (Anderson et al., 2012). Research relies primarily on self-report measures, with the most frequently used being a validated scale of symptom

severity known as the Night Eating Questionnaire (NEQ; Allison et al., 2008). The NEQ contains 14 items that assess the behavioural and psychological symptoms of NES, and is used as a screening tool (Lundgren et al., 2012). A 12-item version of the NEQ known as the Night Eating Symptom Scale (NESS) is used for tracking symptom change (O'Reardon, Stunkard, et al., 2004). Another measure, the Night Eating Diagnostic Questionnaire (NEDQ; Gluck et al., 2001), assesses the severity of NES and provides clinically useful diagnostic categories (i.e., mild, moderate, or full syndrome). This scale demonstrates convergent validity with the NEQ (Nolan & Geliebter, 2017) and according to principle components analysis is a good measure of NES criteria (Nolan & Geliebter, 2019).

The Night Eating Syndrome History and Inventory (NESHI) is the only semi-structured interview currently available for the assessment of NES (see Lundgren, Allison, et al., 2012). The NESHI assesses the severity of NES (i.e., sub threshold, full threshold) and establishes whether research diagnostic criteria (Allison, Lundgren, O'Reardon et al., 2010) are met for NES. The 14 items of the NEQ are included in the NESHI but psychometric properties of the full interview have not yet been established.

Given that the self-report measures discussed above (i.e., NEQ, NESS, and NEDQ) do not contain a dietary recall component to capture quantity and type of food intake, several studies have also used prospective food diaries to assess night eating. Although some NES studies have used a longer monitoring period of 10 days (Allison, Grilo, et al., 2005) or 14 days (Boseck et al., 2007), the majority of studies have used an assessment period of one week (e.g., Birketvedt et al., 1999; Goel et al., 2009; O'Reardon, Ringel, et al., 2004; Pawlow et al., 2003; Rogers et al., 2006).

Comorbidities

Aside from the night eating behaviour itself, NES is associated with a number of mental and physical health comorbidities. These include perceived stress, rumination, depression symptoms, anxiety, sleep problems, and obesity – each of which are described in more detail below.

Stress

Night eating is most likely to occur during periods of life stress (Stunkard et al., 1955), with up to 74% of night eaters reporting that their night eating began during a stressful time in their lives (Allison et al., 2004). Researchers have proposed that individuals with NES may have a general vulnerability to stress whereby they perceive stressful life events as less controllable and/or predictable (Caredda et al., 2009; Vander Wal, 2012). Night eaters report significantly higher levels of perceived stress (Lundgren, Allison, et al., 2008) and have elevated levels of cortisol (Birketvedt et al., 1999), a hormone released in response to stress. Mediation analyses suggest that higher levels of perceived stress may lead to night eating because of the use of maladaptive coping strategies such as denial (Wichianson et al., 2009). Other researchers have proposed that night eating itself may be a learned aspect of mood regulation in response to stress (Vander Wal, 2012).

Rumination. Although not well established in the literature, there is reason to suspect that rumination is related to night eating. The construct originated from the literature on depression and is conceptualized as a transdiagnostic factor (Nolen-Hoeksema et al., 2008; Nolen-Hoeksema & Watkins, 2011). According to response styles theory (Nolen-Hoeksema, 1991), rumination is a form of responding to distress that involves repetitively and passively focusing on the causes and consequences of one's own distress without engaging in active

coping to alleviate negative mood states. It is conceptualized as a relatively stable and maladaptive coping strategy (Nolen-Hoeksema, 1991).

Night eaters may repetitively think about their problematic eating patterns, including the possible consequences of such behaviour like weight gain, guilt, or shame (e.g., "I am disgusted that I ate just before going to bed"; Allison, 2012a, pp. 237). Rumination reduces concurrently with a decrease in night eating, providing preliminary evidence that the two are related (Williamson et al., 1989). Among patients with clinical depression, night eaters report significantly greater rumination and poorer sleep quality than non-night eaters (Kucukgoncu et al., 2014). However, given the well-established link between rumination and depression (Nolen-Hoeksema, 1991), the findings reported by Kucukgoncu et al. do not provide information on the extent to which rumination is related to the night eating as opposed to depression because their entire sample consisted of those with clinical depression. It therefore remains to be seen whether there is an association between night eating and rumination outside of the context of depression. This is a viable question given that rumination (Moulds et al., 2007) and night eating (Thompson & Debate, 2010) have independently been found in nonclinical samples (i.e., samples free of clinical depression).

Rumination is implicated in a number of psychological conditions that are associated with NES, including stress (Michl et al., 2013), depression (Aldao et al., 2010; Nolen-Hoeksema, 1991; Nolen-Hoeksema et al., 2008; Rood et al., 2009), anxiety (Blagden & Craske, 1996; Davey, 1995; Mellings & Alden, 2000; Nolen-Hoeksema, 2000; Verstraeten et al., 2011), and sleep problems (Guastella & Moulds, 2007; Thomsen et al., 2003; Zoccola et al., 2009). Rumination, as a response to the distress associated with NES, might help to explain these comorbidities. However, the role of rumination among NES remains relatively uninvestigated.

Depression Symptoms

In some individuals, night eating is related to depressed mood (Allison, Grilo, et al., 2005; Allison et al., 2007; Boseck, et al., 2007; Calugi et al., 2005; de Zwaan et al., 2006; Friedman et al., 2004; Gluck et al., 2001; Lundgren, Allison, et al., 2008; Striegel-Moore et al., 2008; 2010; Thompson & DeBate, 2010). Night eaters not only report more severe depressed mood than controls, they also report mood that worsens in the evening (after 4 P.M.) whereas controls do not (Birketvedt et al., 1999). Mood is lowest during nocturnal awakenings (Boseck et al., 2007), and nocturnal eaters (i.e., those who wake at night to eat) report more severe depression symptoms than night eaters who do not wake at night to eat (Colles et al., 2007). Overall, the mood in NES follows an atypical pattern, meaning that mood tends to be better in the morning and worse during the evening.

The majority of those with NES report levels of depression symptoms that are within the moderate (18.5%) or severe (44.4%) range (Calugi et al., 2009). Night eaters are significantly more likely to meet criteria for MDD than controls (Lundgren, Allison, et al., 2008). For instance, 18.8% of night eaters have a current diagnosis of MDD (de Zwaan et al., 2006) which is well above the rate for the general population (6.6%; APA, 2013). Due to the cross-sectional nature of most studies, it remains uncertain whether depressed mood is a (causal) risk factor for NES or an associated feature. A recent longitudinal study (Guentcheva et al., 2019) found that depression symptoms measured in adolescence are associated with night eating in young adulthood, however age of NES onset was not measured. Other researchers have postulated that the worsening of mood in the evening is a consequence of a circadian delay in food intake or an expression of shame and frustration over increased nighttime eating and associated weight gain (Vander Wal, 2012).

Anxiety

Compared to healthy controls, night eaters report higher levels of both state and trait anxiety (Pawlow et al., 2003). Clinical levels of anxiety are common, with night eaters being significantly more likely to meet criteria for an anxiety disorder than controls (Lundgren, Allison, et al., 2008). For instance, elevated rates of generalized anxiety disorder (GAD) are found among night eaters (17%; de Zwaan et al., 2006) in comparison to the general population (2.9%; APA, 2013). Evening eating, depressed mood, and sleep disturbances are correlated with nightly anxiety but not with daily anxiety among night eaters (Sassaroli et al., 2009). Thus, it is plausible that individuals with NES eat during nocturnal awakenings, when they feel the worst, in an attempt to alleviate negative mood, promote sleep and ease anxiety-driven insomnia during the night (Vander Wal, 2012).

Sleep Problems

Although NES is characterized by a delay in the circadian pattern of eating, a normal sleep-wake cycle is retained, meaning that the timing of sleep cycles for individuals with NES are phase appropriate (Goel et al., 2009; O'Reardon, Ringel, et al., 2004; Rogers et al., 2006). Despite this, night eaters report trouble falling or staying asleep (Allison et al., 2010; Birketvedt et al., 1999; O'Reardon, Ringel, et al., 2004), compromised sleep quality (Lundgren, Allison, et al., 2008), and reduced sleep efficiency (Rogers et al., 2006; Spaggiari et al., 1994). Nocturnal eaters, in particular, have more trouble staying asleep than night eaters who do not wake to eat (Ceru-Bjork et al., 2001). Researchers propose that it may be the delayed eating rhythm that secondarily disrupts sleep among night eaters (Stunkard et al., 2005) by causing gastrointestinal discomfort and difficulty sleeping (Crispim et al., 2011).

Obesity

NES, which was originally described in a sample of individuals with obesity (Stunkard et al., 1955), is positively associated with weight gain and increased body mass index (BMI) in some individuals (Bruzas & Allison, 2019). Individuals with NES who are non-obese are significantly younger (difference of 8.9 years) than individuals with NES who are obese, and 52% of night eaters with obesity report that the onset of their night eating preceded the onset of their obesity (Marshall et al., 2004). NES severity is also positively associated with BMI in individuals between the ages of 31 and 60, but not in individuals who are younger (< 31 years; Meule et al., 2014). Therefore, weight gain may occur only after an individual has engaged in night eating for some time, explaining why non-existent or negligible associations between NES and body mass are found in younger samples such as students (e.g., Nolan & Geliebter, 2012). Taken together, NES may represent a developmental pathway to obesity. Researchers have postulated that behavioural impulsivity is a possible mechanism linking prolonged NES to obesity, given that NES severity is associated with greater delay discounting (i.e., preference for smaller but immediate rewards rather than larger but delayed rewards; Malesza, 2020).

Treatment

As mentioned, the biobehavioural model (Stunkard et al., 2009) states that NES results from a genetic predisposition that leads to enhanced reuptake of serotonin when coupled with stress. The loss of available postsynaptic serotonin leads to dysregulation of circadian rhythms and decreased feelings of satiety. Therefore, from a pharmacological treatment perspective, the use of SSRIs should increase the availability of postsynaptic serotonin, and in doing so alleviate NES symptoms (Vander Wal, 2014). From a psychological or behavioural perspective, interventions aimed at reducing stress, increasing serotonin, addressing circadian rhythm

dysregulation, and improving satiety should be effective for the treatment of NES (Vander Wal, 2014). These perspectives are discussed below within the context of existing empirical evidence.

Pharmacological Interventions

Serotoninergic agents such as sertraline and escitalopram are successful in reducing caloric intake after the evening meal, number of nocturnal awakenings and ingestions, and also improve mood and promote weight loss (Allison et al., 2013; O'Reardon, Stunkard, et al., 2004; O'Reardon et al., 2006; Stunkard et al., 2006; Vander Wal et al., 2012). To date, only two of these studies are classified as randomized controlled clinical trials (O'Reardon et al., 2006; Vander Wal et al., 2012) and concerns have been raised about the cost, stability of treatment response, side effects, and placebo response (Vander Wal, 2012, 2014). Future research is needed to address these concerns before any firm conclusions can be drawn. Of note, empirical evidence also supports the efficacy of sertraline and escitalopram in several mood and anxiety disorders (Baldwin et al., 2007; Sheehan & Kamijima, 2009). Thus, it could be argued that the effect of these medications observed in individuals with NES could be partially explained by a depression- or anxiety-reducing mechanism (O'Reardon et al., 2005), both of which are linked to rumination (e.g., Nolen-Hoeksema, 1991, 2000).

Phototherapy Interventions

Given that melatonin is implicated in the regulation of circadian rhythms and that night eating is associated with disruptions of the hormone (Birketvedt et al., 1999), phototherapy which readjusts the circadian rhythm is a plausible treatment choice for individuals with NES. To date, there are two published case studies (Friedman et al., 2002; 2004) and one pilot study (McCune & Lundgren, 2015) that have examined the efficacy of phototherapy/bright light therapy (BLT) for NES. In the two case studies, both symptoms of depression and night eating

significantly improved, and patients no longer met criteria for either major depression or NES following the treatment regime. These results advocate for the role of phototherapy in treating comorbid depression and NES. The more recent pilot study explored the effect of BLT in NES for those without comorbid depression (only one of the 15 participants met full criteria for MDD). Significant reductions in night eating, mood disturbance, and sleep disturbance were observed among night eaters who completed two weeks of daily 10,000 lux BLT administered in the morning. The results of these studies provide preliminary support for the efficacy of BLT for the treatment of NES with and without comorbid depression.

Psychological and Behavioural Interventions

Psychological and behavioural interventions produce change by altering behavioural contingencies such as affect, thoughts, assumptions, and beliefs. Such approaches may be beneficial and appropriate for certain individuals with NES who do not respond to, or only partially respond to, medications; who experience unwanted side effects; or who prefer not to take medications to begin with (Vander Wal, 2014). Despite requiring more time and investment than medications, psychological (as well as behavioural) interventions offer the advantages of teaching a skill set that can be maintained over time (Berner & Allison, 2013).

Cognitive Behavioural Therapy (CBT). CBT is an active and directive therapy used to treat a variety of psychiatric disorders based on the rationale that an individual's affect and behaviour are largely determined by the way he or she views the world (Beck et al., 1979). Experiencing specific food cravings, feeling anxious, stressed, depressed, or bored, believing that one has to eat to fall back asleep, and experiencing a strong urge to eat in order to feel the satisfaction of having food in one's stomach have been identified as themes amongst night eaters (Allison et al., 2004). Based on these themes, a CBT approach for NES (Allison, 2012b;

Lundgren & Allison, 2015) was designed by modifying components from CBT protocols for BED (Fairburn et al., 1993), insomnia (Morin et al., 1999, 2006), and behavioural weight loss (Brownell, 2004). Its primary aim is to correct the delay in circadian eating rhythms by shifting food intake away from the evening towards earlier hours of the day while at the same time disrupting the learned association between night eating, faulty beliefs, and sleep (Allison & Stunkard, 2010). Strategies used to accomplish this aim include a mixture of elements of CBT for insomnia (sleep education, sleep hygiene, stimulus control, restriction of time in bed, and addressing night worry), behavioural weight management techniques (monitoring food intake, standardizing meals and snacks, restricting the number of daily calories consumed), and cognitive techniques (identifying, evaluating, and changing maladaptive thoughts; Lundgren & Allison, 2015). Relaxation strategies are also prescribed in this CBT protocol to decrease stress associated with reduced caloric intake (Allison et al., 2004).

Dysfunctional Thought Records (DTRs; a CBT technique) based on those used for the treatment of depression have been developed with examples applicable to individuals with NES (see Allison, 2012a). These DTRs are based on the premise that a certain situation evokes a thought, which is accompanied by an emotion, and leads to an outcome. For example, the thought *"If I don't eat something, I'll be awake all night"* may be accompanied by anxiety, which influences behaviour (e.g., going to the kitchen to get a snack) that results in a negative outcome (e.g., feeling shame; Lundgren & Allison, 2015). The initial intervention for night eaters therefore consists of establishing a link between night eating behaviour and thoughts and feelings in order to encourage new ways of thinking and behaving that will help maintain a normal circadian eating pattern and improve mood.

This CBT approach reduces evening eating, nighttime awakenings, nocturnal ingestions,

and total calories consumed, while also promoting weight loss (Allison et al., 2010). CBT appears most effective in reducing the amount of food consumed during nocturnal ingestions (from 15.5% to 5%), not between dinner and bedtime (from 21.8% to 21.0%). However, it may be too early to draw such conclusions as this is based on only a single pilot study. Furthermore, although this study supports the potential effectiveness of CBT for NES, the high dropout rate (44%) suggests that participant burden and the intensity of treatment may have been too much. Therefore, a shorter intervention that is able to target and benefit more individuals is warranted (Kocukgoncu et al., 2015).

Progressive Muscle Relaxation (PMR). Another intervention that has demonstrated efficacy with NES is PMR. Twenty minutes of abbreviated progressive muscle relaxation therapy practiced nightly before bed for one week significantly reduces stress, anxiety, fatigue, anger and depression among night eaters (Pawlow et al., 2003). The same study also found PMR to be associated with significantly higher morning and lower evening ratings of hunger, and a trend toward more food intake at breakfast and less nighttime snacking. A more recent randomized control study (Vander Wal et al., 2015) utilizing a stacked treatment protocol and similar PMR to Pawlow et al. (2003) found that participants in all three groups (educational group, education + PMR group, education + PMR + exercise group) experienced significant reductions in NES symptoms, depression, anxiety, and perceived stress. The only significant between group change was for the percent of food eaten after the evening meal, with the education + PMR group showing the greatest reduction (30.54%), compared to the educational group (9.5%). This is in contrast to the CBT study (Allison et al., 2010) mentioned above, which found greater reductions in nocturnal ingestions (i.e., consumption of food upon awakening from sleep) compared to evening hyperphagia (i.e., consumption of > 25% of total daily food intake

after dinner but before bed). A key difference is that the CBT pilot study also included a cognitive component which addressed negative automatic thoughts (e.g., "I won't be able to fall asleep if I don't have something to eat") whereas the PMR studies did not (Vander Wal et al., 2015). A cognitive component may therefore be essential for the reduction of nocturnal ingestions (Vander Wal et al., 2015).

The therapeutic benefit of PMR supports the notion that NES is linked to stress. This is in line with the biobehavioural model (Stunkard et al., 2009) that suggests behavioural and psychological interventions can theoretically decrease stress, improve circadian functioning, and increase satiety; representing one plausible mechanism of change. Results lend preliminary support to the role of education and relaxation in the treatment of NES. However, further studies are needed to see if improvements are maintained beyond three weeks. Researchers care encouraged to also investigate other stress management techniques (Vander Wal, 2014).

Behavioural Weight Management. Since obesity is linked to NES, behavioural weight management represents another plausible treatment approach. This treatment regime which includes psychoeducational groups, activities designed to foster behavioural change, a low-calorie diet, and regular exercise is effective at eliminating night eating symptoms by improving satiety and resetting circadian eating rhythms (Grave et al., 2011). behavioural weight management for the treatment of NES holds a promising future, especially when combined with CBT (Allison et al., 2010). Researchers have suggested, however, that it may be beneficial for future studies to explore the effectiveness of less intensive programs (Allison & Tarves, 2011).

Mindfulness and Stress Reduction

Using the biobehavioural model of NES as a guide (Stunkard et al., 2009), the benefits of a stress-reduction exercise (i.e., PMR) for night eaters in reducing night eating, depression,

anxiety, and perceived stress, and increasing morning appetite lends support to the notion that the development and/or maintenance of NES is linked to stress (Pawlow et al., 2003; Vander Wal et al., 2015). The majority of contemporary stress reduction efforts involve mindfulness-based interventions (MBIs). Mindfulness is viewed as a universal human capacity and is defined as the awareness that arises through intentionally attending to the present moment (i.e., one's own feelings, thoughts, and bodily sensations) in an open, caring, and nonjudgmental way (Shapiro & Carlson, 2009). It is often conceptualized as both a dispositional characteristic and as a skill that can be learned and practiced over time.

Mindfulness can be traced back as far as 6 BCE to Buddhist practices of meditation (Kumar, 2002). According to Buddhist teachings, mindfulness reduces distress by increasing insight, promoting personal growth, and connecting the external and internal environment within an individual in a meaningful way (Kumar, 2002). After Kabat-Zinn suggested that mindfulness might be useful to people in Western society, the practice was imported into mental health programs and interventions without its religious and cultural traditions (Kabat-Zinn, 1982) and used to treat a variety of ailments such as chronic pain, depression, anxiety, and binge eating.

Interventions such as acceptance and commitment therapy (ACT; Hayes et al., 2009), dialectical behavior therapy (DBT; Linehan, 1993), mindfulness-based stress reduction (MBSR; Kabat-Zinn, 2003), and mindfulness-based cognitive therapy (MBCT; Segal et al., 2013) are all designed to increase mindfulness and represent what some have called the third wave of behaviour therapy (Bauer, 2003). MBCT specifically is associated with significant improvements in stress, depression, anxiety, and insomnia symptoms (Ree & Craigie, 2007).

Mindfulness is thought to be associated with these positive health outcomes by buffering the effects of stressful life events (Bränström et al., 2011; Ciesla et al., 2012; Marks et al., 2010).

Given its incompatibility with mindfulness, another proposed mechanism underlying the therapeutic effects of MBIs, is rumination. In support of this hypothesis, several studies have demonstrated that MBIs significantly reduce rumination, which accounts for the efficacy of the interventions (Ciesla et al., 2012; Coffey & Hartman, 2008; Heeren & Philippot, 2011; Jain et al., 2007; Labelle et al., 2010; Ramel et al., 2004). According to a systematic review and meta-analysis of mediation studies, moderate and consistent evidence exists for rumination as a mechanism underlying the effectiveness of MBIs (Gu et al., 2015).

Building mindfulness skills promotes the ability to direct attention to the present moment, which may make it easier to direct attention away from ruminative thoughts. Supporting this viewpoint, individuals who are highly mindful ruminate less (Williams, 2008). By becoming more mindful, individuals grow to be more aware and less judgmental of their experiences (Barnard & Curry, 2011; Germer, 2009; Kiken, 2011), allowing themselves to be less critical in their thinking and more accepting of their thoughts and feelings (Shapiro et al., 2006, 2008). It is argued that this acceptance effectively allows individuals to stop ruminating (Teasdale et al., 1995, 2003). This may represent a potential pathway through which increased mindfulness leads to decreased rumination, that in turn contributes to less negative health outcomes (Alleva et al., 2014; Borders et al., 2010). It is possible that decreased rumination may be one mechanism by which mindfulness can lead to a reduction in night eating and associated features (e.g., depressed mood, anxiety, and sleep problems). To the author's knowledge, there are no known published studies that have examined this hypothesis.

Summary

NES is characterized by a circadian delay in eating and nocturnal awakenings involving the consumption of food (Birketvedt et al., 1999; O'Reardon, Ringel, et al., 2004). The

syndrome is linked to perceived stress (Lundgren et al., 2008; Wichianson et al., 2009), depressed mood that typically worsens in the evening (Birketvedt et al., 1999), anxiety (Sassaroli et al., 2009), poor sleep quality (Lundgren et al., 2008), and obesity (Marshall et al., 2004). Etiology remains unclear but according to the biobehavioural model of NES (Stunkard et al., 2009) a combination of stress and genetic susceptibility may lead to dysregulation of appetite- and sleep-related hormones causing a circadian delay and reduced feelings of satiety.

Although night eating typically occurs during times of stress (Allison et al., 2004; Caredda et al., 2009; Stunkard et al., 1955), stress itself does not necessarily lead to negative outcomes. Instead, it is the extent to which individuals respond to stress with unsuccessful coping strategies that appears to be the critical factor determining such outcomes (Genet & Siemer, 2012). It is suspected that rumination, a maladaptive coping strategy and transdiagnostic process underlying multiple forms of psychopathology (Nolen-Hoeksema & Watkins, 2011), may be implicated in NES. Rumination is significantly higher among night eaters with co-morbid depression compared to non-night eaters with clinical depression (Kucukgoncu et al., 2014). However, given the intimate relationship between depression and rumination and the fact that this sample consisted of individuals with clinical depression, it is unclear whether NES is related to rumination outside of the context of depression.

The rigid dwelling on past negative experiences that characterizes rumination is in stark contrast to the intentional and flexible present focus of mindfulness (Borders et al., 2010). In fact, reductions in rumination account for the positive psychological benefits of many MBIs (Gu et al., 2015). To date, no study has examined the association between NES and rumination, as well as sleep parameters, prior to and following participation in an MBI. Moreover, aside from a single CBT pilot study (Allison, Lundgren, Moore et al., 2010) and brief relaxation training

exercise (i.e., PMR; Pawlow et al., 2003; Vander Wal et al., 2015), there is no psychological or behavioural intervention that has been proposed to treat NES.

While CBT appears to effectively reduce NES symptoms (Allison, Lundgren, Moore et al., 2010), as does PMR (Pawlow et al., 2003; Vander Wal et al., 2015), it is not known how these interventions lead to symptom improvement because the pathways or underlying mechanisms have not yet been explored. It is suspected that rumination may help to explain the severity of NES and associated problems (e.g., depression symptoms, anxiety, poor sleep quality), and that intervening to reduce rumination via mindfulness training may help to improve NES symptoms.

Present Study

The present study consisted of two separate but related parts (Part A and Part B) that examined the link between night eating and rumination. Part A utilized online self-report measures to investigate the link between NES severity and rumination in a nonclinical sample of students after accounting for the presence of depression symptoms. Part B explored the role of rumination among individuals classified as night eaters within the context of a prospective MBI designed to reduce rumination. Their hypotheses, methods, and results are written up separately and delineated below.

Part A: Objective and Hypotheses

The objective of Part A was to investigate the link between NES severity and rumination in a nonclinical sample of students after accounting for the presence of depression symptoms. Given that night eating typically occurs during times of stress and that rumination is a response to stress that is associated with negative outcomes, Part A also investigated whether the link

between perceived stress and NES severity is stronger among students with higher levels of rumination compared to those with lower levels. The following three hypotheses were proposed:

1. Night eaters would report greater levels of rumination, perceived stress, depression symptoms, anxiety, and poorer sleep quality than non-night eaters.
2. Rumination would be associated with NES severity after controlling for the effect of depression symptoms.
3. Rumination would moderate the link between perceived stress and NES severity.

Part A: Method

Participants

A total of 919 students recruited from Lakehead University participated in Part A during the period of May 2017 to December 2018. To participate, individuals had to be students and at least 18 years old. Exclusion criteria for analyses included (a) a diagnosis of depression; (b) treatment for depression (i.e., taking antidepressants or receiving psychotherapy); (c) self-reported sleep disorder (other than insomnia), substance use disorder, or eating disorder (other than NES); (d) working regular or rotating night shifts; and (e) pregnancy. Exclusion criteria were assessed by an anonymous list contained within the screening questionnaire, whereby participants indicated if any of the above exclusions applied to them but did not need to indicate which one. Participants meeting exclusionary criteria (n = 165) were not included in the analyses. These students were excluded in an attempt to remove potential confounds and to preserve the nonclinical nature of the sample. Twenty-nine students were also excluded for having more than 80% of their data missing and 12 were excluded for being outliers (see results section).

The final sample size used for statistical analyses therefore consisted of 713 students (156 men, 557 women). The mean age of the sample was 20.72 years (SD = 4.76). Additional sample demographics can be found in Table 1.

Also included in Table 1 is the number of participants identified as night eaters. A total of 47 (6.6.%) of the 713 participants included in the analyses were classified as night eaters (i.e., NEQ score of 25 or greater). Non-night eaters were defined as those scoring 24 or less on the NEQ. There were no significant differences between night eaters and non-night eaters with respect to sex, age, ethnicity, or relationship status. However, night eaters were significantly more likely than non-night eaters to be classified as poor sleepers, $\chi^2(1) = 10.31$, $p = .001$, $\varphi = 0.12$.

Measures

The Research Questionnaire (see Appendix B) was composed of a demographic section and several self-report measures as described below. Internal consistency (Cronbach's alpha) for each scale used in the present study is reported in Table 2.

Section A

This section asked participants to indicate their demographic information such as age, sex, ethnicity, diagnoses, and medication or drug use. The information was used to obtain an understanding of the composition of the sample and to assess exclusionary criteria (e.g., absence of a depression diagnosis).

Section B

The Night Eating Questionnaire (NEQ; Allison et al., 2008) is a 14-item self-report measure designed to assess both the behavioural and psychological symptoms of NES. Areas assessed include eating and sleeping patterns, awareness, and mood disturbance. All items are

Table 1

Part A: Sample Demographics Expressed by Frequency (Percentage)

Demographics	Non-NES	NES	Total	*p*
N (%)	666 (93.4)	47 (6.6)	713	
Sex (%)				.41[a]
Male	148 (22.2)	8 (17)	156 (21.9)	
Female	518 (77.8)	39 (83)	557 (78.1)	
Age (Mean ± *SD*)	20.67 ± 4.82	21.49 ± 3.80	20.72 ± 4.76	.25[b]
Ethnicity (%)				.41[a]
Aboriginal	43 (6.5)	2 (4.3)	45 (6.3)	
Caucasian	532 (79.9)	39 (83.0)	571 (80.1)	
Black	18 (2.7)	0 (0)	18 (2.5)	
Asian	51 (7.7)	3 (6.4)	54 (7.6)	
Latino/Hispanic	3 (0.5)	1 (2.1)	4 (0.6)	
Other	19 (2.9)	2 (4.3)	21 (2.9)	
Relationship Status (%)				.24[a]
Not in a relationship	341 (51.2)	22 (46.8)	363 (50.9)	
In a relationship	300 (45)	20 (42.6)	320 (44.9)	
PSQI Sleep Status (%)				<.001[a]
Normal Sleeper	165 (24.8)	2 (4.3)	167 (23.4)	
Poor Sleeper	501 (75.2)	45 (95.7)	546 (76.6)	

Note. PSQI = Pittsburgh Sleep Quality Index.
[a] Pearson chi-square test.
[b] Independent sample *t*-test.

Table 2

Part A: Scale Internal Consistency (Cronbach's Alpha)

Variable	Cronbach's Alpha
Night Eating (NEQ)	.68
Perceived Stress (PSS)	.86
Rumination (RRS)	.94
Depression Symptoms (HDRS)	.87
State Anxiety (STICSA)	.92
Trait Anxiety (STICSA)	.93
Sleep Quality (PSQI)	.69

Note. $N = 713$. NEQ = Night Eating Questionnaire; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale; HDRS = Hamilton Depression Rating Scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; PSQI = Pittsburgh Sleep Quality Index.

scored on a scale ranging from 0 to 4. Items 1, 4, and 14 are reverse scored. Item 13, which assesses awareness of nocturnal ingestions, is included only as a screening item to rule out the presence of SRED and is not included in the final scoring. Two supplemental questions (items 15 and 16) ask how upsetting the night eating is to respondents and how much it has affected their lives. These items can be used as an index of impairment but are not included in the final scoring. All other items are summed to obtain a global score, which can range from 0 to 52, where higher scores reflect greater NES severity. Accepted cut-off values of 25 or more (or 30 or more for increased specificity) are commonly used in the literature to identify night eaters (Allison et al., 2008). In the present study, individuals scoring 25 or more on the NEQ were classified as night eaters and those scoring 24 or less were classified as non-night eaters. Cronbach's alpha for the NEQ is reported to be .70 (Allison et al., 2008), which is similar to what was found in the present study.

Section C

The Perceived Stress Scale (PSS; Cohen et al., 1983) is the most widely used self-report measure of stress. It is designed to address the degree to which situations in a respondent's life are appraised as stressful. Respondents are asked to indicate how often they have felt their lives to be unpredictable, uncontrollable, and unmanageable over the last month. The original scale contains 14 items but a shorter 10-item version that allows for the assessment of perceived stress without any loss of psychometric quality was used in the present study (Cohen & Williamson, 1988). Each item is rated on a 5-point Likert scale that ranges from 0 (*never*) to 4 (*very often*). Items 4, 5, 7, and 8 are reverse scored. Higher scores reflect greater levels of perceived stress. Cohen and Williamson (1988) report the PSS-10 has adequate reliability and validity, with a Cronbach's alpha coefficient of .78.

Section D

The Ruminative Responses Scale (RRS; Treynor et al., 2003) is a 22-item self-report measure of rumination based on how respondents generally think. The RRS contains subscales for both reflection and brooding that are nonredundant in content with depression scale items. The authors of the RRS propose that all five reflection items (7, 11, 12, 20, and 21) of the scale are of neutral valence, capture rumination as engaging in contemplation or pondering, and also capture elements of coping. The five brooding items (5, 10, 13, 15, and 16), on the other hand, capture moody pondering or thinking anxiously or miserably about a situation, event, etc. Items on the RRS are rated using a Likert scale of 1 (*almost never*) to 4 (*almost always*). The reflection subscale has a Cronbach's alpha of .72 and a test-retest correlation of .60, while the brooding subscale has a Cronbach's alpha of .77 and test-retest correlation of .62 (Treynor et al., 2003). For the purposes of this study, a total rumination score was used in the main analyses.

Section E

The 21-item Hamilton Depression Rating Scale (HDRS; Hamilton, 1960) is a self-report scale designed to measure the severity of depression symptoms experienced over the past week. Items are keyed on a 5-point Likert scale, ranging from 0 (*not at all*) to 4 (*marked or severely*). Summing items 1 to 17 provides an overall score, while the remaining four items (18 to 21) offer additional clinical information. Higher HDRS scores are indicative of greater depression severity. Reports on internal consistency range from .46 to .97, and test-retest reliability ranges from .81 to .98 (Bagby et al., 2004).

Section F

The State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA; Ree et al., 2008) is a self-report measure that assesses both the cognitive and somatic symptoms of anxiety and

distinguishes these features within both state and trait anxiety scales. A key advantage of the STICSA is that items are less weighted towards depression symptoms in comparison to the widely used State-Trait Anxiety Inventory (STAI; Spielberger et al., 1970). The STICSA state and trait scales both contain 21 identical items; however, the former assesses how respondents feel in the moment and the latter assesses how respondents generally feel. Items are rated on a 4-point Likert scale, ranging from 1 (*not at all*) to 4 (*very much so*). Reliability and validity of the STICSA are supported in both clinical and nonclinical samples (Grös et al., 2007; 2010). Both state and trait anxiety were assessed in the present study.

Section G

The Pittsburgh Sleep Quality Index (PSQI; Buysse et al., 1989) is a 19-item self-report questionnaire that measures sleep quality over the past month. Nineteen items tap into subjective sleep quality, sleep latency, sleep duration, habitual sleep efficiency, sleep disturbances, use of sleeping medication, and daytime dysfunction; each representing a component score weighted equally on a scale from 0 to 3. These seven component scores are summed to yield one global score. Higher scores reflect poorer sleep quality, where a global sum of five or more can be used to categorize individuals as poor sleepers. The PSQI has demonstrated acceptable measures of internal homogeneity, consistency, and validity, and a global PSQI score > 5 yields a diagnostic sensitivity of 89.6% and specificity of 86.5% (kappa = .75, $p < .001$) in distinguishing between good and poor sleepers (Buysse et al., 1989).

Recruitment Procedure

Recruitment commenced once Research Ethics Board (REB) approval for the study was obtained. Students from Lakehead University (Thunder Bay and Orillia campuses) were recruited via email (see Appendix C) and advertisements posted on campus bulletin boards (see

Appendix D). Students were also recruited via social media (e.g., Facebook) and other avenues such as the SONA research recruitment system which is operated by the Department of Psychology at Lakehead University.

Recruitment advertisements invited volunteers to take part in a study that involved the completion of several online self-report measures examining the association between night eating, stress, mood and sleep. Advertisements outlined that it was not necessary for volunteers to consider themselves night eaters in order to participate but that they must be students and at least 18 years old. Contact information and the research questionnaire weblink were provided.

Those who were interested in the study accessed the research questionnaire directly and at their own convenience using the weblink provided on the recruitment message. The research questionnaire was hosted on www.surveymonkey.com. SurveyMonkey provides a secure web base for survey construction, data collection, and data analysis.

Main Procedure

Individuals who responded to the recruitment message were directed to an online cover letter (see Appendix E) that introduced the study. Those who decided to continue, were directed to an online consent form where they read more detailed information about the study and gave their informed consent to participate (see Appendix F). After reviewing the consent form participants clicked on the "PROCEED" button at the bottom of the page. This indicated that they had fully read and understood the information stated in the consent form and that they voluntarily wished to participate in the study.

At study completion and before being debriefed, participants were directed to another weblink where they were informed of the possibility to participate in another study that involved free mindfulness sessions. Those who were interested in participating or in learning more about

the study had the opportunity to leave their contact information so that the researcher could contact them. It was made clear to potential participants that there was no obligation for leaving their contact information. Following this message, participants were debriefed and given a list of community mental health resources (see Appendix G). Those who requested a copy of the summary of results received a copy by email.

Lakehead University Introductory Psychology students and students enrolled in other courses that permitted credit for research participation received one bonus point towards their final course mark upon completion of the research questionnaire. All participants were entered into a random prize draw for one of two $50 VISA gift cards. Participants who were ineligible or who did not wish to obtain bonus credits received an extra entry into the random prize draws.

Part A: Results

Pre-Analysis Issues

Missing Data

The dataset was examined for missing data, which was dealt with by replacing the missing value of a case by its mean of all non-missing (valid) items (Dodeen, 2003). For those participants (n = 21) with more than 5% of missing items within a certain scale or subscale, a total score for that scale or subscale was not calculated and was excluded from analyses (Graham, 2009).

Univariate and Multivariate Outliers

The dataset was screened for both univariate and multivariate outliers. The guideline of a z-score greater than $\pm$ 3.29 standard deviations (Tabachnick & Fidell, 2019) was used to identify univariate outliers. Ten univariate outliers were found and removed from the dataset given the large sample size. Multivariate outliers were identified as having both a Mahalanobis distance

with χ^2 value that was significant at $p < .001$ (Tabachnick & Fidell, 2019) and a standard Cook's distance greater than one (Stevens, 2002). Mahalanobis distance identifies multivariate outliers while Cook's distance identifies whether they are influential; thus, both indices were used. Two multivariate outliers were found and removed from the dataset.

Normality, Linearity, and Homoscedasticity

Skewness and kurtosis of the dataset were both assessed by visually inspecting the distribution of scores and by determining whether the skewness and kurtosis statistic was significant as indicated by values of $\pm$ 2 standard errors (Tabachnick & Fiddell, 2019). Residual scatterplots were also constructed between predicted criterion variable scores and errors of prediction, and their resulting trends observed. Based on statistics and observations, assumptions of linearity and homoscedasticity were met.

Multicollinearity

Variables were checked for multicollinearity and singularity as this can interfere with the interpretation of results. Multicollinearity and singularity were detected by correlations greater than .90 and near 1.00, respectively (Tabachnick & Fidell, 2019). The highest correlation of .85 was found between state and trait anxiety (see Table 3). Therefore, no variables were excluded from analyses.

Descriptive Statistics

Descriptives were run via SPSS on all variables to verify plausible ranges, means, and standard deviations. For a summary of means and standard deviations for all variables within the total sample ($N = 713$), along with their minimum and maximum values, please refer to Table 4.

Table 3

Part A: Bivariate Correlations Among Variables (Total Sample)

Variable	1	2	3	4	5	6	7
1. Night Eating (NEQ)							
2. Perceived Stress (PSS)	.35*						
3. Rumination (RRS)	.43*	.71*					
4. Depression (HDRS)	.45*	.67*	.76*				
5. State Anxiety (STICSA)	.39*	.62*	.73*	.75*			
6. Trait Anxiety (STICSA)	.42*	.64*	.74*	.76*	.85*		
7. Sleep Quality (PSQI)	.46*	.44*	.43*	.57*	.41*	.44*	

Note. $N = 713$. NEQ = Night Eating Questionnaire; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale; HDRS = Hamilton Depression Rating Scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; PSQI = Pittsburgh Sleep Quality Index.
*$p < .01$.

Table 4

Part A: Overall Means (Standard Deviations) and Minimum and Maximum Values

Variable	Mean (*SD*)	Minimum	Maximum
Night Eating (NEQ)	15.99 (4.96)	3	32
Perceived Stress (PSS)	19.80 (6.23)	3	36
Rumination (RRS)	43.40 (13.04)	22	83
Depression Symptoms (HDRS)	15.92 (10.72)	0	50
State Anxiety (STICSA)	32.96 (10.21)	21	68
Trait Anxiety (STICSA)	36.53 (11.36)	21	76
Sleep Quality (PSQI)	7.11 (3.17)	0	17

Note. $N = 713$. NEQ = Night Eating Questionnaire; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale; HDRS = Hamilton Depression Rating Scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; PSQI = Pittsburgh Sleep Quality Index.

Main Analyses

Hypothesis One

The first hypothesis stated that night eaters would report greater levels of rumination, perceived stress, depression symptoms, anxiety, and poorer sleep quality than non-night eaters. To address this hypothesis, comparisons between the two groups on the criterion variables were conducted using a series of independent sample *t*-tests. Although group sizes were vastly different, there was homogeneity of variances ($p > .05$) for all criterion variables, as assessed by Levene's test for equality of variances.

Table 5 reports the within-group means and standard deviations for each variable, and the results of the *t*-tests along with the effect size for each comparison. Compared to non-night eaters, night eaters reported significantly higher levels of rumination, perceived stress, depression symptoms, state anxiety, trait anxiety, and poor sleep quality. According to Cohen's *d* conventions, the effect size for all of these comparisons is considered large, with the exception of perceived stress, which is considered a medium sized effect.

Hypothesis Two

The second hypothesis stated that rumination would be associated with NES severity after controlling for the effect of depression symptoms. To address this hypothesis, hierarchical multiple regression on rumination was used with depression symptoms entered in the first step, and NES severity entered in the second step as predictors. This examined whether the addition of NES severity improved the prediction of rumination over and above depression symptoms alone.

According to the analyses (see Table 6), depression significantly predicted rumination. However, adding NES severity to the prediction of rumination led to only a small but statistically

Table 5

Part A: Group Means and Independent Samples t-Tests with Effect Size (Hypothesis 1)

Variable	NES	Non-NES	*t (df)*	Cohen's *d*[a]
n (%)	47 (6.6)	666 (93.4)		
PSS (Mean ± *SD*)	23.64 ± 5.84	19.53 ± 6.17	4.43* (711)	0.68
RRS (Mean ± *SD*)	57.21 ± 11.40	42.43 ± 12.59	7.83* (711)	1.23
HDRS (Mean ± *SD*)	27.96 ± 10.86	15.07 ± 10.19	8.35* (711)	1.23
STICSA-S (Mean ± *SD*)	43.38 ± 10.81	32.23 ± 9.76	7.52* (711)	1.08
STICSA-T (Mean ± *SD*)	49.19 ± 11.40	35.64 ± 10.82	8.27* (711)	1.22
PSQI (Mean ± *SD*)	10.19 ± 3.13	6.89 ± 3.06	7.13* (711)	1.06

Note. *N* = 713. NES = Night Eating Syndrome. NEQ = Night Eating Questionnaire; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale; HDRS = Hamilton Depression Rating Scale; STICSA-S = State-Trait Inventory for Cognitive and Somatic Anxiety-State; STICSA-T = State-Trait Inventory for Cognitive and Somatic Anxiety-Trait; PSQI = Pittsburgh Sleep Quality Index.
[a] Cohen's *d* interpretive guidelines: 0.2 small, 0.5 medium, 0.8 large effect.
* $p < .001$.

Table 6

Part A: Hierarchical Multiple Regression – Night Eating Severity Predicting Rumination after Controlling for Depression Symptoms (Hypothesis Two)

Variable	*B*	95% CI for B		*SE B*	β	R^2	$\triangle R^2$
		LL	*UL*				
Step 1						.58	.58*
HDRS	0.92*	0.87	0.98	0.03	0.76*		
Step 2						.59	.01*
HDRS	0.86*	0.80	0.92	0.03	0.71*		
NEQ	0.29*	0.15	0.43	0.07	0.11*		

Note. $N = 713$. CI = confidence interval; LL = lower limit; UL = upper limit; HDRS = Hamilton Depression Rating Scale; NEQ = Night Eating Questionnaire.
*$p < .001$.

significant increase in R^2 of .01, $p < .001$.

Hypothesis Three

The third hypothesis stated that rumination would moderate the link between perceived stress and NES severity. To address this hypothesis, a moderation analysis was conducted using PROCESS v3.4 Model 1 (Hayes, 2013) for SPSS. Perceived stress served as the predictor variable, rumination as the potential moderator variable, and NES severity as the criterion variable.

According to the results (see Table 7), the overall model was statistically significant. However, the interaction term (PSS x RRS) emerged as nonsignificant. As confirmed in Figure 1, the relationship between perceived stress and NES severity was not conditional on the level rumination present.

Part B: Objective and Hypotheses

The focus of Part B was to examine the implementation and effectiveness of a novel mindfulness-based intervention (MBI) for the treatment of NES based on the biobehavioural model. More specially, the objective was to examine the role of rumination among night eaters within the context of a prospective MBI with a randomized control group. A single blind (participants) parallel design was employed using simple randomization with a 1:1 allocation ratio. Pre- and post-assessment of rumination, NES severity, and associated problems such as perceived stress, depression and anxiety symptoms, and sleep quality were carried out. The following two hypotheses were proposed:

Table 7

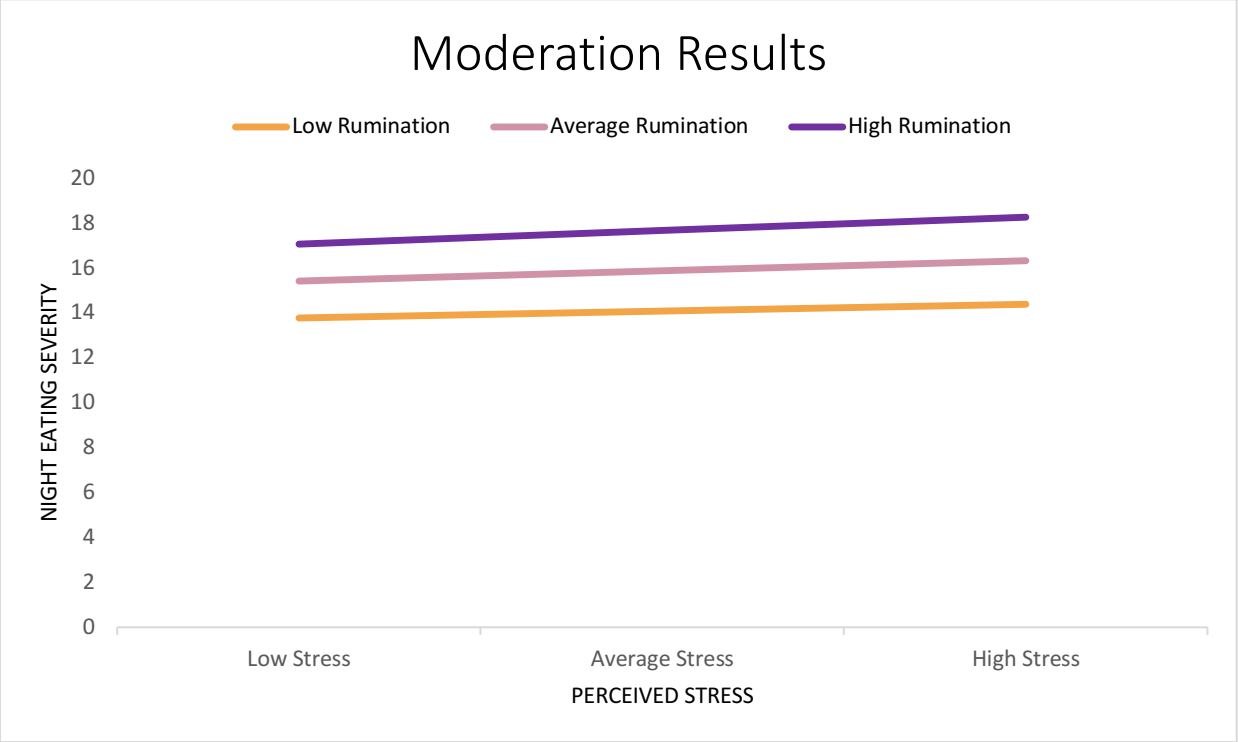
Part A: Rumination as a Moderator Between Perceived Stress and Night Eating Severity (Hypothesis 3)

Variable	*B*	95% CI for B		*SE B*	R^2	$\triangle R^2$	*F*
		LL	*UL*				
					.19	.00	0.83
PSS	0.07	- 0.00	0.15	0.04			
RRS	0.14*	0.10	0.17	0.02			
PSS x RRS	0.00	- 0.00	0.01	0.00			

Note. $N = 713$. CI = confidence interval; LL = lower limit; UL = upper limit; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale.
*$p < .001$.

Figure 1

Part A: Rumination as a Moderator Between Perceived Stress and Night Eating Severity (Hypothesis 3)



Note. $N = 713$. This figure demonstrates the relationship between perceived stress and night eating severity at low, average, and high levels of rumination. The relationship between perceived stress and night eating severity was not conditional on the level rumination present.

1. Following the MBI, night eaters would experience an increase in mindfulness and a decrease in rumination, NES severity, perceived stress, depression symptoms, state anxiety, and poor sleep quality.
2. The positive effects of the MBI would be partially mediated by a reduction in rumination.

Part B: Method

Participants

A total of 247 Lakehead University students recruited from Part A and a separate open invitation completed the screening questionnaire for Part B during the period of June 2017 to June 2019. Screening of all participants was undertaken to identify night eaters and to ensure that they were suitable and able to participate in the study. Inclusion criteria included (a) being a student attending Lakehead University's Thunder Bay campus; (b) no formal mindfulness training or practice within the past four weeks; (c) absence of a depression diagnosis; and (d) night eater status confirmed by the NEQ prior to enrollment. Exclusion criteria included (a) participation in formal psychotherapy or psychopharmacological treatment in the past three months; (b) history of a psychotic disorder or unprocessed trauma; (c) self-reported sleep disorder (other than insomnia), substance use disorder, or eating disorder (other than NES); (d) working regular or rotating night shifts; and (e) pregnancy. Exclusion criteria were assessed by an anonymous list contained within the screening questionnaire, whereby participants indicated if any of the above exclusions applied to them but did not need to indicate which one.

Of the 247 respondents who filled out the screening questionnaire, 79 were identified as night eaters (NEQ score of 25 or greater). Fifty-one of these night eaters qualified to participate in the study. The 28 night eaters who did not qualify, were excluded from further participation for one or more of the anonymous reasons listed above.

All 51 night eaters who qualified for participation were contacted and invited to participate in the main study. A total of 18 respondents agreed to participate. Participants were randomly assigned to the mindfulness group (n = 9) or a waitlist (n = 9) that was used as a control group. One participant from the mindfulness group dropped out prematurely and failed to complete the intervention and post-measures. Their data is therefore not included in the analyses. As can be seen in Table 8, the final sample used for analyses consisted of 17 (1 male, 16 female) participants with a mean age of 24.18 years (*SD* = 6.20). There were no significant differences between the mindfulness and waitlist groups on any of the included demographic variables (see Table 8) or criterion variables (including NES severity) at Time 1 (pre-intervention; see Table 9).

Measures

Screening Questionnaire

The screening questionnaire (see Appendix H) was composed of several self-report items, including the NEQ, to identify night eaters. The remaining items were asked to ensure suitability to participate in the study (see inclusion and exclusion criteria described above).

Research Questionnaire

The Research Questionnaire (see Appendix I) was composed of several self-report measures. Also included was a Home Record Practice Form that was used during the mindfulness intervention period. Internal consistency (Cronbach's alpha) for each scale used in the present study at Time 1 (pre-intervention) and Time 2 (post-intervention) is listed in Table 10.

Section A. The 12-item Cognitive and Affective Mindfulness Scale-Revised (CAMS-R; Feldman et al., 2007) was used as a self-report measure of mindfulness. The CAMS-R captures

Table 8

Part B: Sample Demographics Expressed by Frequency (Percentage)

Demographics	Mindfulness	Waitlist	Total	*p*
n (%)	8 (47.1)	9 (52.9)	17	
Sex (%)				.33[a]
Male	0 (0)	1 (11.1)	1 (5.9)	
Female	8 (100)	8 (88.9)	16 (94.1)	
Age (Mean ± SD)	22.25 ± 7.23	25.89 ± 4.91	24.18 ± 6.20	.24[b]
Ethnicity (%)				.35[a]
Aboriginal	1 (12.5)	1 (11.1)	2 (11.8)	
Caucasian	5 (62.5)	7 (77.8)	12 (70.6)	
Black	0 (0)	1 (11.1)	1 (5.9)	
Asian	2 (25.0)	0 (0)	2 (11.8)	
Relationship Status (%)				.09[a]
Not in a relationship	5 (62.5)	2 (22.2)	7 (41.2)	
In a relationship	0 (0)	5 (55.6)	5 (29.4)	
PSQI Sleep Status (%)				----[c]
Normal Sleeper	0 (0)	0 (0)	17 (0)	
Poor Sleeper	8 (100)	9 (100)	17 (100)	

[a] Pearson chi-square test.
[b] Independent sample *t*-test.
[c] No statistic computed because variable is a constant.

Table 9

Part B: Independent Samples t-Tests Examining Baseline Differences Among Variables

Demographics	Mindfulness	Waitlist	Total	*p*
CAMS Time 1 (Mean ± SD)	25.50 ± 6.50	28.89 ± 5.95	27.29 ± 6.26	.28
NESS Time 1 (Mean ± SD)	23.38 ± 9.58	25.22 ± 5.56	24.35 ± 7.52	.63
PSS Time 1 (Mean ± SD)	24.88 ± 5.99	24.89 ± 4.78	24.88 ± 5.21	.99
RRS Time 1 (Mean ± SD)	55.43 ± 15.15	56.67 ± 13.06	55.82 ± 13.16	.79
HDRS Time 1 (Mean ± SD)	25.57 ± 14.18	27.11 ± 14.25	26.06 ± 13.41	.74
STICSA Time 1 (Mean ± SD)	41.00 ± 13.03	44.00 ± 17.97	42.88 ± 15.10	.76
PSQI Time 1 (Mean ± SD)	9.57 ± 3.46	11.33 ± 3.46	10.59 ± 3.35	.35

Note. CAMS-R = Cognitive and Affective Mindfulness Scale-Revised. NESS = Night Eating Symptom Scale; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale; HDRS = Hamilton Depression Rating Scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; PSQI = Pittsburgh Sleep Quality Index.

Table 10

Part B: Scale Internal Consistency (Cronbach's Alpha)

Variable	Time 1	Time 2
Mindfulness (CAMS)	.85	.81
Night Eating (NESS)	.74	.61
Perceived Stress (PSS)	.74	.81
Rumination (RRS)	.92	.92
Depression Symptoms (HDRS)	.90	.82
State Anxiety (STICSA)	.95	.94
Sleep Quality (PSQI)	.33	.61

Note. $N = 17$. Participants were randomly assigned to participate in a mindfulness group ($n = 8$) or a waitlist group ($n = 9$). The mindfulness group received a 4-week intervention while the waitlist group received no intervention. Time 1 = pre-intervention assessment. Time 2 = post-intervention assessment (5 weeks following Time 1). CAMS = Cognitive and Affective Mindfulness Scale-Revised; NESS = Night Eating Symptom Scale; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale; HDRS = Hamilton Depression Rating Scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; PSQI = Pittsburgh Sleep Quality Index.

a broad conceptualization of mindfulness with clear everyday language that is not specific to any one particular type of meditation training, which allows the scale to be used with a variety of samples. Items adequately sample four domains of mindfulness (attention, present-focus, awareness, and acceptance/nonjudgment) but for the purpose of the present study, are combined into one overall score. Each item is rated on a 4-point Likert scale ranging from 1 (*rarely/not at all*) to 4 (*almost always*) and several items are reverse scored including items 2, 6, and 7. Higher scores reflect greater mindful qualities. The CAMS-R demonstrates acceptable internal consistency and evidence of convergent and discriminant validity (Feldman et al., 2007). The overall CAMS-R score was used to assess for possible changes in mindfulness before and after the intervention period for both groups.

Section B. The 13-item version of the NEQ known as the Night Eating Symptom Scale (NESS; O'Reardon, Stunkard et al., 2004) was used to track night eating symptom change before and after the intervention period. Items are rated on a scale ranging from 0 to 4. Items 1, 4, and 11 are reversed scored. Items 7 and 8 are open-ended and ask respondents to indicate how many times they got up in the middle of the night and how many times they consumed food during an awakening during the past week. These items are scored as follows, 0 = 0 points, 1 to 2 times = 1 point, 3 to 4 times = 2 points, 5 to 6 times = 3 points, and 7+ times = 4 points. Higher scores reflect greater NES symptomatology. Although the NESS has not been directly validated, the psychometric properties of the NEQ from which the items are taken from have been established (Allison et al., 2008).

Section C. The 10-item PSS (Cohen et al., 1983) previously described on page 27was used to assess subjectively appraised stress before and after the intervention period.

Section D. The RRS (Treynor et al., 2003) previously described on page 28 was used to

assess rumination before and after the intervention period.

Section E. The HDRS (Hamilton, 1960) previously described on page 28 was used to assess depression symptoms before and after the intervention period.

Section F. The state scale of the STICSA (Ree et al., 2008) previously described on page 28 was used to assess state anxiety before and after the intervention period.

Section G. The PSQI (Buysse et al., 1989) previously described on page 29 was used to assess sleep quality before and after the intervention period.

Section H. A Home Practice Record Form (adapted from Segel et al., 2013) was provided to participants in the mindfulness group; it served as a homework check over the course of the four weeks. Each week participants filled out a different form that corresponded to that week's mindfulness skills that were being taught. For example, homework for week one consisted of a daily body scan meditation, mindful eating, and mindfully engaging in another routine activity of their choosing (e.g., brushing their teeth). Participants were asked to keep track of the amount of time in number of minutes and days per week that they spent practicing the various mindfulness techniques that were taught to them.

Recruitment Procedure

Recruitment commenced once REB approval for the study was obtained. Participants from Part A who indicated their interest in Part B were contacted and invited to also participate in this study, which involved the opportunity to take part in free mindfulness sessions. These participants were contacted via email (see Appendix J) and a weblink to the screening questionnaire was provided to them. A separate open invitation was also used to recruit interested individuals who did not participate in Part A. Emails (see Appendix K), advertisements (see Appendix L) posted on campus bulletin boards, social media (e.g., Facebook

and Instagram), local advertising (e.g., Thunder Bay Coffee News), and the SONA system operated by the Department of Psychology at Lakehead University were the various outlets used to recruit these individuals. These advertisements also included a weblink to the screening questionnaire.

Main Procedure

Screening

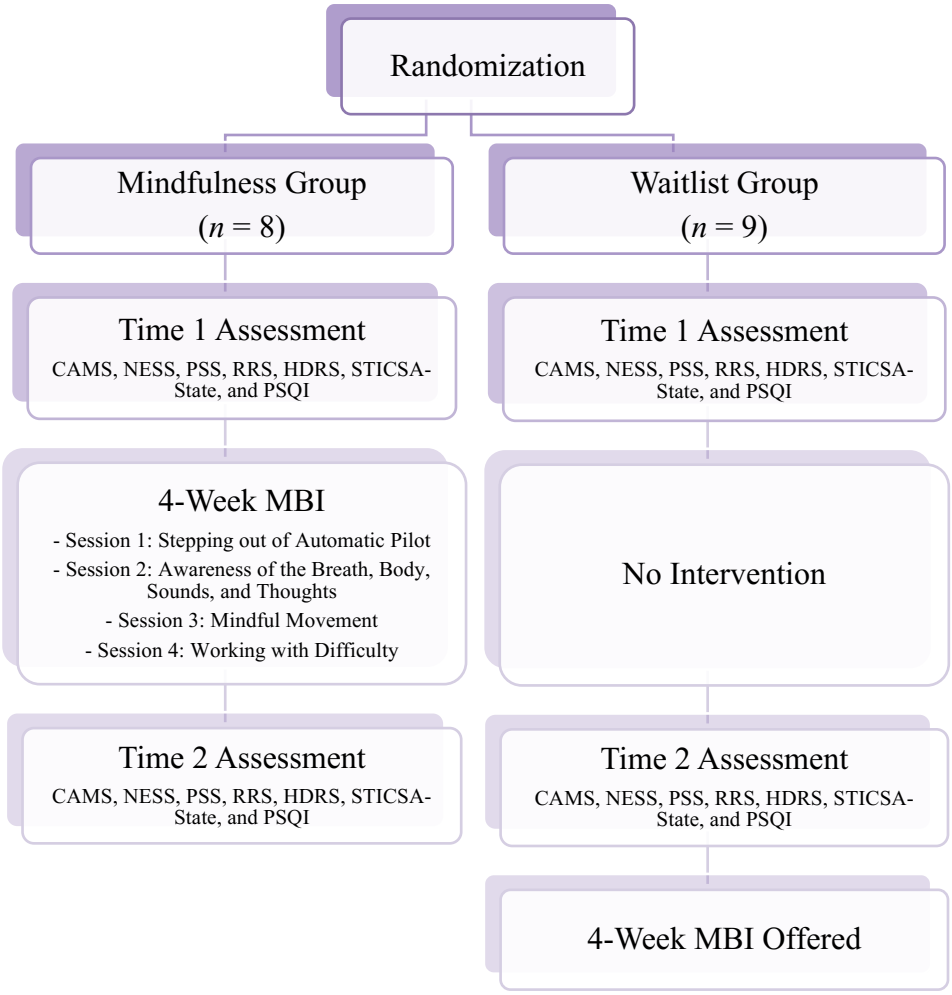
Figure 2 displays the sequence of events pertaining to the procedures of Part B. Interested individuals who were invited back from Part A and those who responded to the open recruitment message were directed to the same online cover letter (see Appendix M) that introduced the study. Individuals who decided to continue were directed to an online consent form where they read more detailed information about the study (see Appendix N). Participants were asked to provide their email so that they could be contacted if they qualified to participate. After reviewing the consent form and filling out appropriate sections, participants were directed to click on the "PROCEED" button at the bottom of the page to indicate their informed consent to participate. Following completion of the screening items, participants were debriefed (see Appendix O) and informed that they would be contacted later in the semester for further participation only if they qualified. All participants were entered into a random prize draw for a $25.00 VISA gift card.

Main Study

Eligible participants were contacted and invited to participate in the main study. Those who were still interested, were asked to come into the laboratory to complete the Time 1 research questionnaire. Upon arrival, participants were shown an online cover letter (see Appendix P) and consent form (see Appendix Q) where they again read detailed information about the study

Figure 2

Part B: Procedure



Note. MBI = mindfulness-based intervention. MBI used in the present study was a condensed version of mindfulness-based cognitive therapy. CAMS = Cognitive and Affective Mindfulness Scale-Revised; NESS = Night Eating Symptom Scale; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale; HDRS = Hamilton Depression Rating Scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; PSQI = Pittsburgh Sleep Quality Index.

and gave their informed consent to participate. Participants who agreed to participate were randomly assigned to either the mindfulness group or the waitlist group using a computerized random number generator. The researcher was aware of group membership, but participants were not. All participants completed the same Time 1 research questionnaire in order to establish an index of baseline functioning. The CAMS-R, NESS, PSS, RRS, HDRS, STICSA-State, and PSQI were hosted online via SurveyMonkey.

After completing the Time 1 research questionnaire, participants were thanked and informed that the researcher would be in touch with them over the next few weeks for the next phase of the study. One bonus point was awarded to Lakehead University students at the Thunder Bay campus who were enrolled in courses that permitted credit for research participation. All participants were also entered into a random prize draw for a $50.00 VISA gift card. Participants who were ineligible or who did not wish to obtain the bonus credit received an extra entry into the random prize draw.

Participants assigned to the mindfulness group were contacted within a week following completion of Time 1 measures and advised of the upcoming mindfulness sessions and schedule. Sessions were offered at a time that accommodated participants' class schedules (afternoon or early evening). Each session ran weekly for one and a half hours for a period of four consecutive weeks on Lakehead University's Thunder Bay campus in the Psychology Clinic. Based on availability of eligible participants, two mindfulness groups were run (November 8th to 29th, 2017 and March 4th to 25th, 2019) each containing 3 and 5 participants, respectively. Enrollment occurred across both fall and winter semesters, controlling for potential differences in seasonal effectiveness (McCune & Lundgren, 2015).

Participants were given handouts in each session and audiotapes of guided meditations

(http://www.guilford.com/guided-meditation-practices-MBCTD), used with permission from the publishers. Audio tracks (3, 4, 5, 6, 8, 9, 12, and 13) were assigned each week to facilitate mindfulness practice and reflection at home in between sessions. After attending a session, participants were responsible for continuing with daily mindfulness practice that evening and tracking their completion of homework for the rest of the week. The following section contains more detailed information regarding the content of each mindfulness session.

For each mindfulness session attended, participants were entered into a $200.00 random prize draw. For practicing and tracking daily mindfulness skills outside of the group sessions, participants were offered additional entries into the $200.00 random prize draw for each day that homework was completed and tracked (for a possible total of 28 additional ballots). Although homework each week contained multiple activities, participants received a ballot if they completed at least one of the activities for that day. It was emphasized to participants that having accurate information about their mindfulness practice was very important and that they would be entered into the draw even if their compliance was poor (e.g., only a portion of their homework was completed). Although this may have harmed compliance rates, it likely helped to increase the accuracy of the practice forms and decreased socially desirable responding (Vander Wal et al., 2015).

Participants from both groups were invited into the laboratory for individual sessions held on the same day to complete Time 2 measures online via SurveyMonkey. These measures were identical to Time 1 measures and included the CAMS-R, NESS, PSS, RRS, HDRS, STICSA-State, and PSQI. Participants in the mindfulness group completed the Time 2 measures one week after the last mindfulness session to allow for homework completion. Participants in the waitlist group completed Time 2 measures at the same time before being given the option to

participate in the mindfulness sessions. Upon completion of all Time 2 measures participants were fully debriefed and given a list of community mental health resources, including information on how to access additional mindfulness services (many free of charge) within the community (see Appendix R). One bonus point was awarded to Lakehead University students at the Thunder Bay campus who were enrolled in courses that permitted credit for research participation. All participants were also entered into the same random prize draw for the $50.00 VISA gift card that they were entered in for completion of the Time 1 research questionnaire. Participants who were ineligible or did not wish to obtain the bonus credit received an extra entry into the random prize draw.

Those in the waitlist group were given the opportunity to participate in the MBI after completing the Time 2 measures. This was done to ensure that all participants were given equal opportunities to participate in all aspects of the study. The facilitator offered participants four free mindfulness sessions and links to the audiotapes (http://www.guilford.com/guided-meditation-practices-MBCTD) for self-practice at home. For each mindfulness session attended, participants were entered into the $200.00 random prize draw. For practicing and tracking daily mindfulness skills outside of the group sessions, participants were offered additional entries into the $200.00 random prize draw for each day that homework was completed and tracked (for a possible total of 28 additional ballots). No data was collected from these participants during their participation in the MBI.

Mindfulness Sessions. The MBI utilized in this study was modeled after the MBCT program developed by Segal et al. (2013). Although the original program consists of eight weekly sessions plus a full day retreat, the present intervention consisted of only four weekly sessions. The duration of the intervention was shortened from the original MBCT length due to

students' time constraints associated with class schedules and exams. Moreover, research indicates that two to four weeks of mindfulness training is effective at enhancing mindfulness skills (Ditto et al., 2006; Kaufman et al., 2010; Tang et al., 2007).

The sessions were facilitated by the first author, whose formal mindfulness training was guided by criteria outlined in the literature (Crane et al., 2010). The facilitator engaged in regular home practice, participated in an eight-week MBCT course, and completed professional MBCT training at the Centre for Mindfulness Studies in Toronto, Ontario.

During each of the four 1.5-hour sessions, participants were taught a series of experiential techniques that used the breath and body sensations to develop nonjudgmental, moment-to-moment awareness, attentional monitoring, and acceptance. These sessions were relevant for targeting rumination given that mindfulness training redirects attention away from intrusive thoughts to an arbitrary concrete focus such as breathing or bodily sensations to prevent further elaboration of the intrusive thoughts (Heeren & Philippot, 2011). The sessions were also designed to include a progression of skills from foundational skills (e.g., focusing attention inward on body sensations) to more advanced skills (e.g., nonjudgmentally exploring the connection between difficult emotions, thoughts, and body sensations). Each session involved a specific theme and participants were given materials and audio tracks to facilitate mindfulness practice and reflection at home.

The theme of the first session was "Stepping Out of Automatic Pilot" and practices included: (1) mindful eating, and (2) the body scan. The raisin exercise involved paying full attention to the experience of eating, both inside and outside of the body (e.g., colors, smells, textures, flavors, temperatures, and sounds). The body scan, on the other hand, involved progressive movement of attention through the body while observing any sensations that arose.

Also included in this session was the thoughts and feelings exercise, where participants imagine walking down the street and seeing someone they know on the other side of the street who does not seem to notice them after the participant smiles and waves to them. This exercise sets the foundation for a discussion about how emotional reactions are often the product of our interpretations of events. Homework included practicing the body scan daily, eating one meal mindfully each day, and practicing mindfulness during a routine activity like brushing your teeth.

The theme of the second session was "Awareness of the Breath, Body, Sounds, and Thoughts" and involved a series of sitting meditations including: (1) mindfulness of the breath, (2) mindfulness of the breath, body, sounds, and thoughts, and (3) the regular three-minute breathing space. Sitting meditations involved awareness of body sensations, thoughts, emotions, and sounds while continually returning the focus of attention to the breath. The three-minute breathing space, in particular, offered three steps of awareness, gathering, and expanding in order to reconnect with the present moment. Homework included practicing mindfulness of the breath daily, the 3-minute breathing space three times a day, and completing a pleasant and unpleasant experiences calendar (the intention of which was to bring mindful awareness to the earliest reaction of an experience – often a pivotal point in triggering rumination; Segal et al., 2013).

The theme of the third session was "Mindful Movement" and practices included: (1) mindful stretching followed by a sitting meditation of mindfulness of the breath, (2) mindful walking, and (3) the responsive three-minute breathing space. Mindful movement consisted of stretches, postures, and walking designed to create greater awareness and balance. The office exercise was also used to demonstrate how thoughts about a situation are often determined by our mood at the time we are thinking. The exercise consists of two identical office scenarios

where a colleague rushes off; however, in version one of this scenario participants are instructed to imagine that they are feeling down because of an argument with another colleague and in version two to imagine feeling happy because they and another colleague were praised for good work. Homework included practicing the stretch and breath meditation on days 1, 3, and 5, mindful movement meditation on days 2, 4, and 6, and the 3-minute responsive breathing space whenever unpleasant feelings were noticed.

The theme of the final session involved "Working with Difficulty" and practices included: (1) mindfulness of the breath, and (2) a working with difficulty sitting meditation, which involved deliberately taking a friendly and gentle awareness to unpleasant experiences and cultivating a willingness to experience the sensations without trying to change them. The reading of a poem entitled *The Guest House* by Rumi was used to encourage participants to cultivate a basic friendliness to all experiences, including the most difficult. The final session also included a discussion of strategies for continuing the mindfulness practices after the study ended. Homework included practicing the "Working with Difficulty" meditation on days 1, 3, and 5, the 3-minute breathing space three times a day, and the 3-minute responsive breathing space whenever unpleasant feelings were noticed. The specific in-class and home practices for each week are outlined in more detail in the protocol listed in Appendix S.

To minimize inconsistencies, all instructions and exercises were read from standardized scripts. However, each session also included mindful inquiry, which was led by the facilitator after each mindfulness exercise to provide participants with an opportunity to discuss and reflect on their experiences with the practice. The approach of the facilitator was consistent with other MBI protocols (Segal et al., 2013).

Part B: Results

Pre-Analysis Issues

Missing Data

The dataset was examined for missing data, which was dealt with by replacing the missing value of a case by its mean of all non-missing (valid) items (Dodeen, 2003). For participants (n = 1) with more than 5% of missing items within a certain scale or subscale, a total score for that scale or subscale was not calculated and excluded from analyses (Graham, 2009). As a result, total Time 2 scores on the RRS, HDRS, STICSA-state subscale, and PSQI were not calculated for one participant from the mindfulness group and were excluded from related analyses.

Adequacy of Sample Size

The required sample size for Part B analyses was 22. This was derived following a power analysis for a 2-between group x 2-within time ANOVA analysis at α = .05 and assuming a small to medium effect size (Cohen's d = .4) and a desired statistical power of .80. The present sample size (N = 17) is not adequate; thus, results should be interpreted with caution. Despite persistent recruitment efforts over the course of two years, the desired sample size could not be achieved. Only 79 of the 247 students who filled out the screening questionnaire were considered potential night eaters, and of these, only 51 met the criteria to participate in the study. More than half of them (n = 33) did not respond to the invitation to participate in the main study.

Treatment Compliance

Participants attended an average of 3.13 (SD = 0.83) sessions out of the possible four. Individuals who attended less than 2 sessions were considered dropouts. The attrition rate was calculated by dividing the number of dropouts by the number of participants and multiplying this

number by 100. Accordingly, the attrition rate was 11.11%. Homework adherence was calculated by dividing the number of homework assignments reported as partially or fully completed by the number of homework assignments given and multiplying this number by 100. Accordingly, participants completed just over half (65.62%) of their assigned homework.

Univariate and Multivariate Outliers

The dataset was screened for both univariate and multivariate outliers. The guideline of a *z*-score greater than $\pm$ 3.29 standard deviations (Tabachnick & Fidell, 2019) was used to identify univariate outliers. No univariate outliers were found. Multivariate outliers were identified as having both a Mahalanobis distance with χ^2 value that was significant at $p < .001$ (Tabachnick & Fidell, 2019) and a standard Cook's distance greater than one (Stevens, 2002). Mahalanobis distance identifies multivariate outliers while Cook's distance identifies whether they are influential; thus, both indices were used. No multivariate outliers were found.

Normality, Linearity, and Homoscedasticity

Skewness and kurtosis of the dataset were both assessed by visually inspecting the distribution of scores and by determining whether the skewness and kurtosis statistic was significant as indicated by values of $\pm$ 2 standard errors. Residual scatterplots were also constructed between predicted criterion variable scores and errors of prediction, and their resulting trends observed. Based on statistics and observations, assumptions of linearity and homoscedasticity were met.

Multicollinearity

Variables were checked for multicollinearity and singularity as this can interfere with the interpretation of results. Multicollinearity and singularity were detected by correlations greater than .90 and near 1.00, respectively (Tabachnick & Fidell, 2019). The highest correlation of .90

was found between rumination and depression symptoms at Time 1. No variables were excluded from analyses. Tables 11 and 12 display the bivariate correlations among the variables for Time 1 and Time 2, respectively.

Descriptive Statistics

Descriptives were run via SPSS on all variables to verify plausible ranges, means, and standard deviations. For a summary of means and standard deviations for all variables within each group at Time 1 and Time 2, please refer to Table 13.

Main Analyses

Hypothesis One

The first hypothesis stated that following the MBI, there would be an increase in mindfulness and a decrease in NES severity, rumination, perceived stress, depression symptoms, state anxiety, and poor sleep quality. These changes were not expected to be seen in the waitlist group. To address this hypothesis, comparisons were made between the mindfulness group and waitlist group on Time 1 and Time 2 scores. A series of 2-between group (mindfulness, waitlist) x 2-within time (Time 1, Time 2) ANOVAs were conducted to compare changes in all criterion variables.

According to the statistical analyses, there was no statistically significant interaction between the groups and time on any of the criterion variables examined (see Table 14). However, the main effect of time demonstrated a statistically significant difference in severity of night eating, rumination, and perceived stress between Time 1 and Time 2, showing a decrease in symptoms. No other significant results were found.

Table 11

Part B: Bivariate Correlations Among Variables (Time 1)

Variable	1	2	3	4	5	6	7
1. Mindfulness (CAMS)							
2. Night Eating (NESS)	- .41						
3. Perceived Stress (PSS)	- .69**	.54*					
4. Rumination (RRS)	- .61**	.41	.89**				
5. Depression (HDRS)	- .56*	.52*	.86**	.90**			
6. State Anxiety (STICSA)	- .43	.28	.71**	.79**	.85**		
7. Sleep Quality (PSQI)	- .25	.40	.44	.43	.47	.21	

Note. $N = 17$. Time 1 = pre-intervention. CAMS = Cognitive and Affective Mindfulness Scale-Revised; NESS = Night Eating Symptom Scale; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale; HDRS = Hamilton Depression Rating Scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; PSQI = Pittsburgh Sleep Quality Index.
*$p < .05$. **$p < .01$.

Table 12

Part B: Bivariate Correlations Among Variables (Time 2)

Variable	1	2	3	4	5	6	7
1. Mindfulness (CAMS)							
2. Night Eating (NESS)	- .71**						
3. Perceived Stress (PSS)	- .76**	.50*					
4. Rumination (RRS)	- .74**	.53*	.66**				
5. Depression (HDRS)	- .66**	.62*	.88**	.71**			
6. State Anxiety (STICSA)	- .68**	.51*	.83**	.56*	.80**		
7. Sleep Quality (PSQI)	- .30	.38	.29	.68**	.52*	.27	

Note. $N = 17$. Time 2 = post-intervention. CAMS = Cognitive and Affective Mindfulness Scale-Revised; NESS = Night Eating Symptom Scale; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale; HDRS = Hamilton Depression Rating Scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; PSQI = Pittsburgh Sleep Quality Index.
*$p < .05$. **$p < .01$.

Table 13

Part B: Group Means at Time 1 and Time 2

Measure	Mindfulness (n = 8)		Waitlist (n = 9)	
	Time 1	Time 2	Time 1	Time 2
CAMS (Mean ± *SD*)	25.50 ± 6.50	28.88 ± 5.96	28.89 ± 5.95	28.89 ± 5.06
NESS (Mean ± *SD*)	23.38 ± 9.58	19.00 ± 5.61	25.22 ± 5.56	21.78 ± 5.43
PSS (Mean ± *SD*)	24.88 ±5.99	21.75 ± 6.50	24.89 ± 4.78	21.44 ± 4.00
RRS (Mean ± *SD*)	55.43 ± 15.15	45.57 ± 16.14	56.67 ± 13.06	47.44 ± 6.54
HDRS (Mean ± *SD*)	25.57 ± 14.18	18.86 ±13.53	27.11 ± 14.25	23.22 ± 7.89
STICSA (Mean ± *SD*)	41.00 ± 13.03	38.00 ± 16.03	44.00 ± 17.97	39.56 ± 11.78
PSQI (Mean ± *SD*)	9.57 ± 3.46	8.43 ± 4.65	11.33 ± 3.46	12.77 ± 4.76

Note. N = 17. Time 1 = pre-intervention. Time 2 = post-intervention. CAMS-R = Cognitive and Affective Mindfulness Scale-Revised. NESS = Night Eating Symptom Scale; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale; HDRS = Hamilton Depression Rating Scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; PSQI = Pittsburgh Sleep Quality Index.

Table 14

Part B: Two-Way Mixed ANOVA Results (Hypothesis 1)

Source	*df*	*F*	*p*	η_p^2
	Outcome variable = Mindfulness (CAMS)			
Group (Between-Subject)	1	0.40	.54	0.03
Error (Group)	15			
Time (Within-Subject)	1	3.18	.10	0.18
Error (Time)	15			
Group x Time	1	3.18	.10	0.18
Error (Group x Time)				
	Outcome variable = Night Eating (NESS)			
Group (Between-Subject)	1	0.62	.44	0.04
Error (Group)	15			
Time (Within-Subject)	1	7.86	.01*	0.34
Error (Time)	15			
Group x Time	1	0.11	.74	0.01
Error (Group x Time)				
	Outcome variable = Perceived Stress (PSS)			
Group (Between-Subject)	1	0.00	.95	0.00
Error (Group)	15			
Time (Within-Subject)	1	6.57	.02*	0.31
Error (Time)	15			
Group x Time	1	0.02	.90	0.00
Error (Group x Time)				
	Outcome variable = Rumination (RRS)			
Group (Between-Subject)	1	0.03	.88	0.00
Error (Group)	15			
Time (Within-Subject)	1	22.84	< .001**	0.62
Error (Time)	15			
Group x Time	1	0.03	.88	0.00
Error (Group x Time)				

Table 14 (Continued)

Part B: Two-Way Mixed ANOVA Results (Hypothesis 1)

Source	*df*	*F*	*p*	η_p^2
	Outcome variable = Depression Symptoms (HDRS)			
Group (Between-Subject)	1	0.28	.61	0.02
Error (Group)	15			
Time (Within-Subject)	1	3.26	.09	0.19
Error (Time)	15			
Group x Time	1	0.23	.64	0.02
Error (Group x Time)				
	Outcome variable = State Anxiety (STICSA)			
Group (Between-Subject)	1	0.11	.74	0.09
Error (Group)	15			
Time (Within-Subject)	1	1.34	.27	0.09
Error (Time)	15			
Group x Time	1	0.05	.83	0.00
Error (Group x Time)				
	Outcome variable = Sleep Quality (PSQI)			
Group (Between-Subject)	1	2.64	.13	0.16
Error (Group)	15			
Time (Within-Subject)	1	0.03	.87	0.00
Error (Time)	15			
Group x Time	1	2.06	.17	0.13
Error (Group x Time)				

Note. $N = 17$.
* $p < .05$. ** $p < .001$.

Hypothesis Two

The second hypothesis stated that the positive effects of the MBI would be partially mediated by reductions in rumination. To address this hypothesis, mediation analysis was conducted using PROCESS v3.4 Model 4 (Hayes, 2013) for SPSS using change scores (Heeren & Philippot, 2011; Jain et al., 2007), with rumination change score serving as the mediator. Change scores for NES severity, perceived stress, depression symptoms, state anxiety, and sleep quality served as dependent variables, and group status (mindfulness vs. waitlist) as the independent variable. Change scores were calculated by subtracting Time 1 scores from Time 2 scores on scales including the RRS, NESS, PSS, HDRS, STICSA-state, and PSQI.

According to Hayes (2013), the following four steps must be confirmed to establish mediation, 1) confirm the significance of the relationship between the independent variable and the dependent variable, 2) confirm the significance of the relationship between the independent variable and the mediator, 3) confirm the relationship between the mediator and the dependent variable in the presence of the independent variable, and 4) confirm the insignificance (or the meaningful reduction in effect) of the relationship between the independent variable and the dependent variable in the presence of the mediator. Steps 3 and 4 are derived from the same regression model. As can be seen in Table 15, no significant results were found.

Although hypotheses for Part B were not supported, it is the size of the effect that determines clinical importance and not necessarily the presence of statistical significance (Jacobsen et al., 1984). Thus, despite the nonsignificant findings, according to Cohen's *d* interpretive guidelines, the effect size for the differences between groups (mindfulness vs. waitlist) as indicated by the change scores (see Table 16) was: large for mindfulness (d = - 0.88), medium for sleep quality (d = - 0.75), and small for depression symptoms (d = - 0.25).

Table 15

Part B: Change in Rumination as a Mediator (M) Between Group Status (X) and Change in Night Eating Severity, Perceived Stress, Depression Symptoms, Anxiety, and Sleep Quality (Hypothesis 2)

Steps/Predictors	β	*b (SE)*	95% CI for *b*		R^2	*F*
			LL	*UL*		
		Dependent Variable Y = Night Eating (△NESS)				
Step 1 (X → Y)						
Group	- 0.10	- 0.56 (2.97)	- 6.93	5.82	.00	0.04
Step 2 (X → M)						
Group	- 0.08	- 0.63 (3.99)	- 9.20	7.93	.00	0.03
Step 3 (M | X → Y)						
△RSS	- 0.06	- 0.05 (0.21)	- 0.49	0.40	.79	0.04
Step 4 (X | M → Y)						
Group	- 0.10	- 0.58 (3.08)	- 9.88	2.15	.79	0.04
		Dependent Variable Y = Perceived Stress (△PSS)				
Step 1 (X → Y)						
Group	- 0.02	- 0.13 (2.71)	- 5.95	5.69	.00	0.00
Step 2 (X → M)						
Group	- 0.08	- 0.63 (3.99)	- 9.20	7.93	.00	0.03
Step 3 (M | X → Y)						
△RSS	0.39	0.27 (0.17)	- 0.11	0.64	.15	1.18
Step 4 (X | M → Y)						
Group	0.01	0.04 (2.59)	- 6.06	4.08	.15	1.18
		Dependent Variable Y = Depression Symptoms (△HDRS)				
Step 1 (X → Y)						
Group	- 0.25	- 2.83 (5.87)	- 15.42	9.78	.02	0.23
Step 2 (X → M)						
Group	- 0.08	- 0.63 (3.99)	- 9.20	7.93	.00	0.03
Step 3 (M | X → Y)						
△RSS	0.45	0.67 (0.36)	- 0.11	1.46	.22	1.84
Step 4 (X | M → Y)						
Group	- 0.21	- 2.40 (5.43)	- 14.13	9.33	.22	1.84

Table 15 (Continued)

Part B: Change in Rumination as a Mediator (M) Between Group Status (X) and Change in Night Eating Severity, Perceived Stress, Depression Symptoms, Anxiety, and Sleep Quality (Hypothesis 2)

Steps/Predictors	β	*b (SE)*	95% CI for *b*		R^2	F
			LL	*UL*		
		Dependent Variable Y = State Anxiety (△STICSA)				
Step 1 (X → Y)						
Group	- 0.70	- 2.59 (1.80)	- 6.45	1.28	.00	0.05
Step 2 (X → M)						
Group	- 0.08	- 0.63 (3.99)	- 9.20	7.93	.00	0.03
Step 3 (M | X → Y)						
△RSS	- 0.00	- 0.01 (0.45)	- 0.97	0.96	.00	0.02
Step 4 (X | M → Y)						
Group	0.12	1.44 (6.67)	- 12.98	15.85	.00	0.02
		Dependent Variable Y = Sleep Quality (△PSQI)				
Step 1 (X → Y)						
Group	- 0.10	- 0.56 (2.97)	- 6.93	5.82	.13	2.06
Step 2 (X → M)						
Group	- 0.08	- 0.63 (3.99)	- 9.20	7.93	.00	0.03
Step 3 (M | X → Y)						
△RSS	- 0.07	- 0.03 (0.12)	- 0.30	0.24	.13	0.99
Step 4 (X | M → Y)						
Group	- 0.70	- 2.61 (1.87)	- 6.64	1.43	.13	0.99

Note. $N = 17$. CI = confidence interval; LL = lower limit; UL = upper limit; RRS = Ruminative Responses Scale; NESS = Night Eating Symptom Scale; PSS = Perceived Stress Scale; HDRS = Hamilton Depression Rating Scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; PSQI = Pittsburgh Sleep Quality Index. Steps 1 to 4 correspond to the four steps specified by Hayes (2013) to investigate mediation.

Table 16

Part B: Effect Size for Group Differences Using Change (△) Scores from Time 1 to Time 2

Measure	Mindfulness (n = 8)		Waitlist (n = 9)		Cohen's d[a]
	Mean (SD)	95% CI	Mean (SD)	95% CI	
△CAMS	3.38 (3.25)	1.13 – 5.63	0.00 (4.39)	- 2.86 – 2.86	0.88
△NESS	- 4.38 (5.60)	- 8.26 – (-) 0.50	- 3.44 (5.85)	- 7.26 – 0.38	- 0.16
△PSS	- 3.13 (4.32)	- 6.13 – (-) 0.13	- 3.44 (5.98)	- 7.34 – 0.46	0.06
△RRS	- 9.86 (7.58)	- 15.49 – (-) 4.23	- 9.22 (8.16)	- 14.55 – (-) 3.89	- 0.08
△HDRS	- 6.71 (6.78)	- 11.73 – (-) 1.69	- 3.89 (14.25)	- 13.20 – 5.42	- 0.25
△STICSA	- 3.00 (13.52)	- 13.02 – 7.02	- 4.44 (4.36)	- 12.38 – 3.50	0.14
△PSQI	- 1.14 (2.12)	- 2.71 – 0.43	1.44 (4.36)	- 1.40 – 4.28	- 0.75

Note. N = 17. Time 1 = pre-intervention. Time 2 = post-intervention. CAMS-R = Cognitive and Affective Mindfulness Scale-Revised. NESS = Night Eating Symptom Scale; PSS = Perceived Stress Scale; RRS = Ruminative Responses Scale; HDRS = Hamilton Depression Rating Scale; STICSA = State-Trait Inventory for Cognitive and Somatic Anxiety; PSQI = Pittsburgh Sleep Quality Index.

[a] Cohen's d interpretive guidelines: 0.2 small, 0.5 medium, 0.8 large effect.

Discussion

Rumination is a transdiagnostic process underlying multiple forms of psychopathology (Nolen-Hoeksema & Watkins, 2011). Yet, little is known about the role of rumination among night eaters aside from the finding that it is significantly higher among night eaters with comorbid depression compared to non-night eaters with clinical depression (Kucukgoncu et al., 2014), and reduces concurrently with a decrease in night eating (Williamson et al., 1989). However, given the intimate relationship between depression and rumination (Nolen-Hoeksema, 1991), the findings from Kucukgoncu et al. might be explained by the greater severity of depression among the night eaters than the non-night eaters.

The present study sought to supplement and build upon the relatively limited research investigating the relationship between NES and rumination. The first objective (Part A) was to investigate whether a link between NES severity and rumination exists in a nonclinical sample of students after accounting for severity of depression symptoms. Furthermore, given that night eating occurs during times of stress (Allison et al., 2004; Caredda et al., 2009; Stunkard et al., 1955) and that rumination is a response to stress associated with negative outcomes (Michl et al., 2013), Part A also examined whether the link between perceived stress and NES severity is stronger among those who ruminate more. A second aim of the study (Part B) was to examine the implementation and effectiveness of a novel mindfulness-based intervention (MBI) for the treatment of NES based on the biobehavioural model proposed by Stunkard et al. (2009). Given that rumination may be relevant to the severity of NES and associated problems like stress and depression, it was suspected that intervening to reduce rumination would help to improve symptoms.

Part A Findings

Part A found that based on scores from the NEQ, 6.6.% of students qualified as night eaters, which is comparable to other studies finding NES prevalence rates ranging from 1.2 to 15% among students (Ahmed et al., 2019; Borges et al., 2017; Elsadek et al., 2014; He et al., 2018, 2019; Meule et al., 2014a, 2014b; Nolan & Geliebter, 2012, 2016; Öner et al., 2018; Riccobono et al., 2020; Runfola et al., 2014; Sevincer et al., 2016; Yahia et al., 2017). NES prevalence rates are considerably higher among students than the general population (1.1 to 6.6%; de Zwaan et al., 2014; Malesza, 2020; Rand et al., 1997; Striegel-Moore et al., 2005; 2006; Stunkard, 2002). This difference could be attributed to the fact that students tend to keep late hours, resulting in increased levels of stress and vulnerability. The academic challenges associated with studying late could theoretically lead to a disruption of students' circadian rhythm, placing them at increased risk for developing NES. The present findings highlight the need to study NES among student populations given the high prevalence rates. In addition, research suggests that NES exerts detrimental effects on the academic performance of university students (i.e., decreased grade point average; Ahmad et al., 2019). Thus, addressing night eating among students may be crucial to improving their academic functioning.

According to results, hypothesis one associated with Part A of the present study was supported. Compared to non-night eaters, night eaters reported significantly higher levels of rumination, perceived stress, depression symptoms, state and trait anxiety, and poorer sleep quality. As well, the between group differences showed large effect sizes with the exception of a medium sized effect for perceived stress. This is consistent with findings from other studies examining NES among students who have found significant associations between NES severity and perceived stress (Borges et al., 2017; Caredda et al., 2009; He et al., 2018, 2019; Wichianson

et al., 2009), depression (Borges et al., 2017; He et al., 2018, 2019; Nolan & Geliebter, 2016, 2017; Sevincer et al., 2016; Thompson & Debate, 2010), anxiety (Borges et al., 2017; He et al., 2018, 2019; Sevincer et al., 2016), and poor sleep quality (Nolan & Geliebter, 2012, 2016, 2017; Yahia et al., 2017). However, this is the first known study to establish a link between NES and rumination among a nonclinical sample. According to previous research, rumination is significantly higher among night eaters with clinical depression compared to non-night eaters with clinical depression (Kucukgoncu et al., 2014). The present study extends this finding to night eaters without co-morbid depression, suggesting that night eaters free of clinical depression also engage in more rumination than non-night eaters without clinical depression. Overall, night eaters appear to experience increased levels of psychopathology compared to non-night eaters. Findings from the present study confirm that they are more stressed out, more depressed, more anxious, have poorer sleep quality, and ruminate more than their non-night eating counterparts.

The second hypothesis was also supported in that NES severity was found to predict rumination over and above depression symptoms, but only to a small degree. Thus, although NES significantly predicts rumination among a non-depressed sample of students, depression symptoms still account for much of the variation. According to previous research, rumination is equivalent in patients who are currently depressed and those who were formerly depressed, suggesting that rumination is not simply dependent on mood state or clinical status (Watkins, 2009). However, these findings suggest that although NES severity can explain some of the variation in rumination, the latter is still heavily tied to depression symptoms, even among a nonclinical sample. Thus, night eaters who are depressed may be at increased risk of ruminating in response to stress compared to their non-depressed counterparts, which could help to maintain their symptoms.

Finally, the third hypothesis was not supported, as it was found that the relationship between perceived stress and NES severity was not conditional on the level of rumination present. A recent qualitative study (Shillito et al., 2018) found onset of night eating was precipitated by stress and a feeling of being overwhelmed, not by hunger, but by emotions. The authors proposed that being more attuned and attentive to feelings and negative thoughts at night led many of their participants to ruminate upon their night eating and emotional distress. Although the present findings do not support the role of rumination in intensifying the link between perceived stress and NES, it may be an important target for intervention aimed at preventing the onset of other negative outcomes like depression and anxiety (Aldao et al., 2010).

Part B Findings

The second aim of the present study (Part B) was to examine the effectiveness of a novel MBI (a condensed 4-week version of MBCT) for the treatment of NES based on the biobehavioural model. A treatment protocol that adheres to the biobehavioural model (Stunkard et al., 2009) would address one or more of the model's core components, including stress management, increasing serotonin, regulating circadian rhythms, and improving satiety. Mindfulness is known to alleviate stress (Shapiro et al., 2008) and the present study predicted that following participation in an MBI, there would be an increase in mindfulness and improvement in NES symptoms. This hypothesis was partially supported. The group that received the MBI showed a significant decrease in NES severity, rumination, and perceived stress from pre- to post-MBI. However, a similar decrease over the same period of time was also seen in the waitlist group that did not participate in the MBI, suggesting that the decrease seen in the treatment group was not necessarily related to the intervention itself. Rather, the decrease observed in both groups could be due to some other shared external factor given that both groups

consisted of students with similar lifestyles, pressures, and expectations. Enrollment in the MBI occurred across both fall and winter semesters (November and March), however, it is possible that the decrease in symptoms observed across both groups coincided with both semesters coming to an end (i.e., excitement about the approaching holidays may have been responsible for reducing stress, night eating, and rumination over time).

The hypothesis that the positive effects of the MBI would be partially mediated or explained by reductions in rumination was not confirmed. Although there was a significant decrease in rumination over time, this change in level of rumination did not account for any improvements in NES severity, perceived stress, depression symptoms, state anxiety, or sleep quality. Moderate and consistent evidence exists for rumination as a mechanism underlying the effectiveness of MBIs (Gu et al., 2015), yet the present study failed to support this finding. Perhaps one explanation for this might lie in the fact that there was no difference between the mindfulness group and the waitlist group in the extent to which their rumination decreased over time. This suggests that the MBI did not play a role in the decreased rumination for the mindfulness group because the waitlist group saw a similar amount of decreased rumination over the same period of time. Another possible explanation could be the small sample size and the nonclinical nature of the sample (i.e., those with a diagnosis of depression were excluded from the analyses). Rumination is strongly associated with depression (Nolen-Hoeksema, 2000), and according to findings from Part A, much of the relationship between NES severity and rumination can be accounted for by depression. Had Part B utilized a larger depressed sample, significant results might have been obtained.

Jacobsen and colleagues (1984) introduced the concept of clinical significance as a way to determine the practical value of a treatment, as opposed to the statistical significance. Thus,

even though hypothesis testing showed no significant difference between both groups from Time 1 to Time 2, an examination of effect sizes revealed noteworthy information. A medium effect size between groups was observed for sleep quality and a small effect size was observed for depression symptoms. The mindfulness group reported better sleep quality following the MBI while the waitlist group reported worse sleep quality over the same period. Both groups reported decreased depression severity over the same period of time; however, the decrease in the mindfulness group was larger than in the waitlist group. As well, those who received the MBI reported increased mindfulness following the intervention while the waitlist group saw no change over the same period of time. The effect size in the group difference in their mindfulness change scores was large. Thus, it could be argued that those in the MBI group demonstrated clinically significant improvements in mindfulness, sleep quality, and depression symptoms.

Summary

To summarize, the present study presents evidence to suggest that rumination is related to NES, but it appears that this relationship is heavily tied to depression symptoms. To extend previous research findings (Kucukgoncu et al., 2014), the present study confirmed that night eaters without clinical depression also report higher levels of rumination than their non-night eating counterparts. NES severity only accounted for 1% of the variance in rumination after controlling for depression, suggesting that the only way rumination factors into NES is through depression. It was also found that the relationship between perceived stress and NES severity is not conditional on the level of rumination present. Following participation in a four-week randomized controlled MBI, a significant decrease in NES severity, rumination and perceived stress was observed over time. However, the same decrease was also observed over the same period of time for the waitlist group who did not participate in the MBI. Although no statistical

significance between groups was found, the MBI demonstrated clinically significant improvements in mindfulness, sleep quality, and depression symptoms according to effect size estimates. Contrary to expectations, rumination did not account for any of the observed improvements.

Strengths and Limitations

Findings from the present study must be considered with its strengths and limitations in mind. One strength of the present study is reflected in the use of a nonclinical sample. Previous research examining rumination among night eaters was conducted using a sample of night eaters with clinical depression, which presents a potential confound. It is recognized, however, that by excluding those with a diagnosis of depression, the findings do not reflect the experiences of those with no or subclinical symptom levels because their depression might have been well managed with maintenance or low doses of antidepressants.

The use of a student sample can be seen as a further methodological strength, given that students are typically a homogenous group. With similar academic and social stressors and comparable schedules, results that were obtained are less likely to be due to differences in lifestyle or environmental demands. That being said, generalizability of the study is limited to university students of similar academic environments and geographic location.

Another strength of the present study is its implementation of a novel intervention for NES using a single blind parallel design and simple randomization. This study also offered the advantage of teaching a skill set that has the potential to be maintained (Berner & Allison, 2013), representing a cost-effective treatment option for individuals with NES. A drawback, however, was that the first author facilitated the mindfulness sessions and was not blind to group status (i.e., intervention vs. waitlist control), which could have introduced bias into the study. To

mitigate potential bias the first author participated in formal training and all mindfulness scripts were standardized.

Another strength was the low attrition rate (11.1%) and to some extent homework compliance (65.62%). Participants attended an average of three out of four sessions (with only one participant dropping out) and completed just over half of their assigned homework, which is comparable to the pooled estimate for participants' MBCT home practice of 64% (Parsons et al., 2017). Although homework compliance rates in the present study were on par with this estimate, Parsons et al. (2009) also reported a small but significant association between participants' self-reported home practice and positive intervention outcomes, suggesting that higher rates of compliance might have enhanced treatment effectiveness. However, factors affecting compliance were not assessed, representing a limitation. Thus, the authors cannot comment on reasons for homework noncompliance, but students often have unstructured and demanding schedules which could make planning, remembering, and integrating mindfulness practices into their schedules difficult. Also, because the timing of participants' mindfulness practice was not controlled for, it is unknown whether the timing of their mindfulness practice influenced the effectiveness of the intervention.

Another limitation was the large difference in sample size between groups in Part A. Night eaters (n = 47) were compared with non-night eaters (n = 666) for the main analyses. Having both unequal group sizes and variances can dramatically affect statistical power and Type I error rates (Rusticus & Lovato, 2014). If group sizes are quite different, the independent samples t-test is sensitive to the violation of the homogeneity of variances assumption. However, this assumption was met for all analyses, as assessed by Levene's test for equality of variances. Nonetheless, it is acknowledged that the large size of the control group gives the

present study more power than is warranted by the 47 night eaters. To ensure equal group sizes, it may have been worthwhile to match the 47 night eaters with 47 non-night eaters on key demographic variables such as sex, age, and BMI category prior to undertaking any data analysis.

A limitation associated with Part B of the present study was the small sample size, which negatively impacted the power of the study. Despite considerable efforts to recruit participants over the course of two years, the desired sample size was not achieved. A strength of the present study, however, was the discussion of clinical significance (Jacobsen et al., 1984) given that small studies often report non-significant results even when the difference is real and important. However, the small sample size is sufficient for the purpose of an initial exploratory study with respect to examining issues of recruitment, retention, randomization, and implementation of a novel intervention (Leon et al., 2011). An alternative approach would be to consider the use of non-parametric statistics given the small sample size.

The sole use of self-report quantitative measures in the present study is also considered a limitation. Measures were vulnerable to reporting and retrospective recall biases and important nuances were likely not captured due to close-ended questions. Although cumbersome, the addition of external measures to validate self-report information would be desirable for future studies to implement. A drawback associated with the NEQ in particular is that persons presenting with evening hyperphagia in the absence of nocturnal ingestions rarely score above the suggested cut off of 25 (Vander Wal, 2012); yet it remains the most widely used screening tool for NES.

It is possible that some individuals with binge eating disorder could have been misclassified as night eaters with evening hyperphagia. Item 5 of the NEQ does however ask

respondents about loss of control over eating, which is a defining feature of BED and is not characteristic of NES; this item could prove useful in distinguishing between the two. There were also concerns for the internal consistency (i.e., below .70) of some measures used (NEQ, NESS, and PSQI) in the present study, which might have affected the reliability of the results. For Part A specifically, the different symptom measures used referred to time frames that ranged from the *past two weeks* to the *past month*. This could pose a problem for state-based symptoms because there is no assurance that the symptoms occurred concurrently.

Unfortunately, the cross-sectional nature of Part A does not allow for causal pathways to be determined directly, and as such can be considered another limitation. Longitudinal studies or ecological momentary assessment are required to confirm temporal patterns.

A final limitation is the absence of BMI measurement. Although both studies contained a question assessing participants' BMI, many participants failed to answer the question completely (i.e., only weight was indicated and not height or vice versa) or accurately (i.e., it was unclear what units were provided), despite being asked to indicate their height in inches and their weight in pounds, resulting in ambiguous responses and the inability to accurately convert their responses. This drawback has particular relevance for the study of NES because of its link to obesity (Bruzas & Allison, 2019). However, this association tends to be non-existent or negligible in student samples (Ahmed et al., 2019; He et al., 2018, 2019; Nolan & Geliebter, 2012, 2016, 2017; Öner et al., 2018; Runfola et al., 2014; Yahia et al., 2017).

Directions for Future Research

According to results, it is largely the presence of depression symptoms that explains the relationship between NES severity and rumination. It is therefore recommended that depression levels be assessed whenever investigating or treating NES. An important future avenue would

be to confirm whether night-eaters with co-morbid depression ruminate more than night eaters without depression. More research is also needed to determine the temporal pattern. Rumination may not cause NES, given that it is recognized as a circadian disorder (Goel et al., 2009; Lundgren, Boston, et al., 2012; O'Reardon, Ringel, et al., 2004), but it could contribute to its severity and comorbidities like depression. Given that rumination is a response to stress that typically precedes depression (Nolen-Hoeksema et al., 2008), it is possible that stress provokes rumination and that depression mediates the relationship between rumination and NES; future research is needed to verify this claim.

Future research could also investigate whether there are differences between the brooding and reflection subtypes of rumination, given that brooding is proposed to be the more maladaptive form of rumination (i.e., more strongly correlated with depression and anxiety symptoms; Watkins, 2009). It is possible that brooding is more strongly correlated with NES as well, but this has yet to be explored.

Rumination may also be especially relevant to nocturnal eaters who experience more difficulty sleeping (Ceru-Bjork et al., 2001) and who report greater depression symptoms (Colles et al., 2007) than night eaters who do not wake from sleep to eat. Thus, an exploration of evening eating versus nocturnal eating subtypes is recommended to further understand their significance and relation to rumination. In addition, qualitative studies and ecological momentary assessment would prove useful in determining the content and timing of night eaters' ruminative thoughts.

Interventions such as CBT appear to be most effective at reducing nocturnal ingestions compared to evening hyperphagia (Allison et al., 2010), while the reverse is true of PMR (Vander Wal et al., 2015). Researchers are therefore encouraged to examine whether MBCT is

differentially effective in reducing evening versus nocturnal eating using a larger sample size and more precise measurements of food intake. An important future avenue would also be to include longer assessment periods or follow-up monitoring to determine if gains are maintained beyond the intervention period.

A high percentage (64.7%) of eligible participants did not respond to the invitation to participate in the present MBI following completion of a screening questionnaire. This is somewhat comparable to other NES pilot studies where 47.5% (Vander Wal et al., 2015) and 35.8% (Allison et al., 2010) of eligible participants did not follow through or were no longer interested in treatment. Reasons for the lack of follow through associated with the present study may include high perceived participant burden (e.g., commitment to four 1.5 hour sessions, daily mindfulness practice, and tracking of homework) and the fact that the timing of the invention period (November and March) coincided with the end of fall and winter semesters, which is a busy and stressful time for students with final assignments due and upcoming exams. It may therefore be beneficial for future studies to explore the effectiveness of less intensive programs. In addition, given the significant challenges with recruitment in general, future researchers may wish to consider greater recruitment initiatives such as offering more flexible sessions, offering direct participant compensation rather than prize draws, designing recruitment postings that are more visually pleasing, and making increased use of email list serves and social media to reach potential participants. Vander Wal et al. (2015) obtained a sample of 44 in their PMR study by employing additional recruitment initiatives such as radio advertising and two brief television interviews.

Future studies may also wish to consider implementing strategies to increase compliance with their interventions. Vander Wal et al. (2015) found that instructing participants to

implement PMR during the evening and helping them plan its implementation was useful in increasing compliance. Future use of smartphone apps, text message reminders, or online portals (rather than paper and pencil logs), may increase homework compliance and ease recording of home practice (Parsons et al., 2017). Smartphone apps may be particularly valuable to NES studies as a method of recording mindfulness practices in real-time (e.g., when participants engage in an unscheduled 3-minute responsive breathing space in response to stress). Future studies may also want to explore whether there are differential effects based on the timing of mindfulness practice (i.e., morning vs. evening) among night eaters.

Conclusion

The present study found that although night eaters reported higher levels of rumination than non-night eaters, there was only a small association between NES severity and rumination after accounting for depression symptoms. Moreover, perceived stress is related to NES severity regardless of the extent to which night eaters engage in rumination. Based on the biobehavioural model of NES, stress management is a core component of treatment. Mindfulness is known to alleviate stress, and there is consistent evidence for rumination as a mechanism underlying the effectiveness of MBIs. Following participation in a four-week MBI, night eaters experienced a significant decrease in NES severity, rumination and perceived stress. However, over the same period of time, the waitlist group reported decreases in these variables as well. Although no statistical significance was found when comparing the two groups in the amount of change they experienced, the MBI demonstrated clinically significant improvements in night eaters' mindfulness, sleep quality, and depression symptoms over time based on effect size estimates. Rumination was not found to explain any benefits of the MBI. Future research is needed to

determine whether mindfulness is a worthwhile pursuit in the treatment of NES and to explore other mechanisms of change underlying the intervention.

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Appendix A

Night Eating Syndrome in the DSM-5

The fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-5) places Night Eating Syndrome (NES) under the category of *Other Specified Feeding and Eating Disorders*, and states the following:

"Recurrent episodes of night eating, as manifested by eating after awakening from sleep or by excessive food consumption after the evening meal. There is awareness and recall of the eating. The night eating is not better explained by external influences such as changes in the individual's sleep-wake cycle or by local social norms. The night eating causes significant distress and/or impairment in functioning. The disordered pattern of eating is not better explained by binge-eating disorder or another mental disorder, including substance use, and is not attributable to another medical disorder or to an effect of medication" (p. 354).

Appendix B

Part A: Research Questionnaire

Section A. This section asks for your demographic information. This is for statistical purposes so that we may know the composition of the people in our study.

Age: _____

Biological Sex: ❒ Male ❒ Female ❒ Other, please specify: _____

What is your height in inches? _____

What is your weight in pounds? _____

Are you a student? ❒ Yes ❒ No

IF a student, what is your educational level?
- ❒ Less than a high school diploma
- ❒ Graduated high school or high school equivalent
- ❒ Current College undergraduate student
- ❒ Current University undergraduate student
- ❒ Current graduate or doctoral student
- ❒ Completed graduate school

Relationship Status:
- ❒ Not in a relationship
- ❒ In a relationship
- ❒ Common-law partner
- ❒ Married partner

IF in a relationship, are you currently living with your partner?
- ❒ Yes
- ❒ No

Ethnicity, please check one:
- ❒ Aboriginal
- ❒ White (origins in Europe, North Africa, Middle East, not of Hispanic origin)
- ❒ Black (origins in Africa, not of Hispanic origin)
- ❒ Asian/Pacific Islander (origins in Far East, Southeast Asia, India Subcontinent, Pacific Islands)
- ❒ Latino or Hispanic (Mexican, Puerto Rican, Cuban, Central or South America, or other Spanish culture or origin)
- ❒ Other, please specify: _____

Do you ***currently*** have a diagnosis of depression provided by a registered health care provider, (e.g., physician, psychologist, psychiatrist or nurse practitioner)?

❒ Yes
❒ No

IF YES, are you currently receiving treatment for it (i.e., taking antidepressants or receiving psychotherapy)?

❒ Yes
❒ No

Please review the list below. Do one or more of these things ***currently*** apply to you?

- I am pregnant
- I work regular or rotating night shifts
- I have a diagnosed sleep disorder other than insomnia (i.e., sleep apnea)
- I have a diagnosed substance use disorder
- I have a diagnosed eating disorder (anorexia nervosa, bulimia nervosa, or binge eating disorder)

❒ None of the above applies to me
❒ At least one of the above applies to me

Section B. The purpose of this form is to find out more about your eating and sleeping patterns. Please choose one answer for each question.

Night Eating Questionnaire (NEQ)

1. How hungry are you usually in the morning?
   - ❒ Not at all
   - ❒ A little
   - ❒ Somewhat
   - ❒ Moderately
   - ❒ Very

2. When do you usually eat for the first time?
   - ❒ Before 9 am
   - ❒ 9:01 am to 12 (noon)
   - ❒ 12:01 noon to 3 pm
   - ❒ 3:01 pm to 6 pm
   - ❒ 6:01 pm or later

3. Do you have cravings or urges to eat snacks after supper, but before bedtime?
   - ❒ Not at all
   - ❒ A little
   - ❒ Somewhat
   - ❒ Very much so
   - ❒ Extremely so

4. How much control do you have over your eating between supper and bedtime?
   - ❒ None at all
   - ❒ A little
   - ❒ Some
   - ❒ Very much
   - ❒ Complete

5. How much of your daily food intake do you consume after suppertime?
   - ❒ 0% (none)
   - ❒ 1–25% (up to a quarter)
   - ❒ 26–50% (about half)
   - ❒ 51–75% (more than half)
   - ❒ 76–100% (almost all)

6. Are you currently feeling blue or down in the dumps?
   - ❒ Not at all
   - ❒ A little
   - ❒ Somewhat
   - ❒ Very much so
   - ❒ Extremely

7. When you are feeling blue, is your mood lower in the:
   - ❒ Early morning
   - ❒ Late morning
   - ❒ Afternoon
   - ❒ Early evening
   - ❒ Late evening/nighttime

   ____check if your mood does not change during the day

8. How often do you have trouble getting to sleep?
   - ❒ Never
   - ❒ Sometimes
   - ❒ About half the time
   - ❒ Usually
   - ❒ Always

9. Other than only to use the bathroom, how often do you get up at least once in the middle of the night?
   - ❒ Never
   - ❒ Less than once a week
   - ❒ About once a week
   - ❒ More than once a week
   - ❒ Every night

********** IF "Never" on #9, PLEASE STOP HERE **********

10. Do you have cravings or urges to eat snacks when you wake up at night?
    - ❒ Not at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Extremely so

11. Do you need to eat in order to get back to sleep when you awake at night?
    - ❒ Not at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Extremely so

12. When you get up in the middle of the night, how often do you snack?
    - ❒ Never
    - ❒ Sometimes
    - ❒ About half the time
    - ❒ Usually
    - ❒ Always

********** IF "Never" on #12, PLEASE STOP HERE **********

13. When you snack in the middle of the night, how aware are you of your eating?
    - ❒ Not at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Completely

14. How much control do you have over your eating while you are up at night?
    - ❒ None at all
    - ❒ A little
    - ❒ Some
    - ❒ Very much
    - ❒ Complete

How long have your current difficulties with night eating been going on?

_____ months _____ years

15. How upsetting is your night eating to you?
    - ❒ Not at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Extremely

16. How much has your night eating affected your life?
    - ❒ Not at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Extremely

Section C. The questions in this scale ask you about your feelings and thoughts <u>during the last month</u>. In each case, you will be asked to indicate how often you felt or thought a certain way.

Perceived Stress Scale (PSS)

0	**1**	**2**	**3**	**4**
Never	Almost never	Sometimes	Fairly often	Very often

	0	1	2	3	4
1. In the last month, how often have you been upset because of something that happened unexpectedly?	❒	❒	❒	❒	❒
2. In the last month, how often have you felt that you were unable to control the important things in your life?	❒	❒	❒	❒	❒
3. In the last month, how often have you felt nervous and stressed?	❒	❒	❒	❒	❒
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	❒	❒	❒	❒	❒
5. In the last month, how often have you felt that things were going your way?	❒	❒	❒	❒	❒
6. In the last month, how often have you found that you could not cope with all the things you had to do?	❒	❒	❒	❒	❒
7. In the last month, how often have you been able to control irritations in your life?	❒	❒	❒	❒	❒
8. In the last month, how often have felt you were on top of things?	❒	❒	❒	❒	❒
9. In the last month, how often have you been angered because of things that happened that were outside your control?	❒	❒	❒	❒	❒
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	❒	❒	❒	❒	❒

Section D. Please read each of the items below and indicate whether you almost never, sometimes, often, or almost always think or do each one when you feel down, sad, or depressed. Please indicate <u>what you generally do</u>, not what you think you should do.

Ruminative Responses Scale (RRS)

1 Almost Never	**2** Sometimes	**3** Often	**4** Almost Always

	1	2	3	4
1. Think about how alone you feel.	❒	❒	❒	❒
2. Think "I won't be able to do my job if I don't snap out of this."	❒	❒	❒	❒
3. Think about your feelings of fatigue and achiness.	❒	❒	❒	❒
4. Think about how hard it is to concentrate.	❒	❒	❒	❒
5. Think "What am I doing to deserve this?"	❒	❒	❒	❒
6. Think about how passive and unmotivated you feel.	❒	❒	❒	❒
7. Analyze recent events to try to understand why you are depressed.	❒	❒	❒	❒
8. Think about how you don't seem to feel anything anymore.	❒	❒	❒	❒
9. Think "Why can't I get going?"	❒	❒	❒	❒
10. Think "Why do I always react this way?"	❒	❒	❒	❒
11. Go away by yourself and think about why you feel this way.	❒	❒	❒	❒
12. Write down what you are thinking about and analyze it.	❒	❒	❒	❒
13. Think about a recent situation, wishing it had gone better.	❒	❒	❒	❒
14. Think "I won't be able to concentrate if I keep feeling this way."	❒	❒	❒	❒
15. Think "Why do I have problems other people don't have?"	❒	❒	❒	❒
16. Think "Why can't I handle things better?"	❒	❒	❒	❒
17. Think about how sad you feel.	❒	❒	❒	❒
18. Think about all your shortcomings, failings, faults, and mistakes.	❒	❒	❒	❒
19. Think about how you don't feel up to doing anything.	❒	❒	❒	❒
20. Analyze your personality to try to understand why you are depressed.	❒	❒	❒	❒
21. Go someplace alone to think about your feelings.	❒	❒	❒	❒
22. Think about how angry you are with yourself.	❒	❒	❒	❒

Section E. Compared to how you feel when you are in an even or normal mood state, how would you rate yourself on the following items <u>during the past 2 weeks</u>?

Hamilton Depression Rating Scale

0 Not at all
1 Just a little
2 More than just a little
3 Quite a bit: moderately
4 Marked or severely

I have been feeling…	0	1	2	3	4
1. Down and depressed.	❒	❒	❒	❒	❒
2. Less interested in doing things.	❒	❒	❒	❒	❒
3. Less interested in sex.	❒	❒	❒	❒	❒
4. Less interested in eating.	❒	❒	❒	❒	❒
5. That I've lost some weight.	❒	❒	❒	❒	❒
6. That I can't fall asleep at night.	❒	❒	❒	❒	❒
7. That my sleep is restless.	❒	❒	❒	❒	❒
8. That I wake up too early.	❒	❒	❒	❒	❒
9. Heavy in my limbs or aches in back, muscles, or head, more tired than usual.	❒	❒	❒	❒	❒
10. Guilty or like a failure.	❒	❒	❒	❒	❒
11. Wishing for death or suicidal.	❒	❒	❒	❒	❒
12. Tense, irritable, or worried.	❒	❒	❒	❒	❒
13. Sure I'm ill or have a disease.	❒	❒	❒	❒	❒
14. That my speech and thoughts are slow.	❒	❒	❒	❒	❒
15. Fidgety, restless, or antsy.	❒	❒	❒	❒	❒
16. That morning is worse than evening.	❒	❒	❒	❒	❒
17. That evening is worse than morning.	❒	❒	❒	❒	❒
18. Unreal or in a dream state.	❒	❒	❒	❒	❒
19. Suspicious of people/paranoid.	❒	❒	❒	❒	❒
20. Preoccupied/obsessed that I must check things a lot.	❒	❒	❒	❒	❒
21. Physical symptoms when worried.	❒	❒	❒	❒	❒

Section F. Below is a list of statements, which can be used to describe how people feel. Beside each statement are four numbers to indicate the degree to which the statement is self-descriptive of your mood (e.g., 1 = not at all, 4 = very much so). Please read each statement carefully and choose the number that best indicates how <u>you feel right now</u>, at this very moment, even if this is not how you usually feel.

State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA)
~ State ~

1	**2**	**3**	**4**
Not at all	A little	Moderately	Very much so

	1	2	3	4
23. My heart beats fast.	❒	❒	❒	❒
24. My muscles are tense.	❒	❒	❒	❒
25. I feel agonized over my problems.	❒	❒	❒	❒
26. I think that others won't approve of me.	❒	❒	❒	❒
27. I feel like I'm missing out on things because I can't make up my mind soon enough.	❒	❒	❒	❒
28. I feel dizzy.	❒	❒	❒	❒
29. My muscles feel weak.	❒	❒	❒	❒
30. I feel trembly and shaky.	❒	❒	❒	❒
31. I picture some future misfortune.	❒	❒	❒	❒
32. I can't get some thoughts out of my mind.	❒	❒	❒	❒
33. I have trouble remembering things.	❒	❒	❒	❒
34. My face feels hot.	❒	❒	❒	❒
35. I think that the worst will happen.	❒	❒	❒	❒
36. My arms and legs feel stiff.	❒	❒	❒	❒
37. My throat feels dry.	❒	❒	❒	❒
38. I keep busy to avoid uncomfortable thoughts.	❒	❒	❒	❒
39. I cannot concentrate without irrelevant thoughts intruding.	❒	❒	❒	❒
40. My breathing is fast and shallow.	❒	❒	❒	❒
41. I worry that I cannot control my thoughts as well as I would like to.	❒	❒	❒	❒
42. I have butterflies in the stomach.	❒	❒	❒	❒
43. My palms feel clammy.	❒	❒	❒	❒

Below is the same list of statements, which can be used to describe how people feel. This time please read each statement carefully and choose the number which best indicates how often, <u>in general</u>, the statement is true of you.

State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA)
~ Trait ~

1	**2**	**3**	**4**
Not at all	A little	Moderately	Very much so

	1	2	3	4
44. My heart beats fast.	❒	❒	❒	❒
45. My muscles are tense.	❒	❒	❒	❒
46. I feel agonized over my problems.	❒	❒	❒	❒
47. I think that others won't approve of me.	❒	❒	❒	❒
48. I feel like I'm missing out on things because I can't make up my mind soon enough.	❒	❒	❒	❒
49. I feel dizzy.	❒	❒	❒	❒
50. My muscles feel weak.	❒	❒	❒	❒
51. I feel trembly and shaky.	❒	❒	❒	❒
52. I picture some future misfortune.	❒	❒	❒	❒
53. I can't get some thoughts out of my mind.	❒	❒	❒	❒
54. I have trouble remembering things.	❒	❒	❒	❒
55. My face feels hot.	❒	❒	❒	❒
56. I think that the worst will happen.	❒	❒	❒	❒
57. My arms and legs feel stiff.	❒	❒	❒	❒
58. My throat feels dry.	❒	❒	❒	❒
59. I keep busy to avoid uncomfortable thoughts.	❒	❒	❒	❒
60. I cannot concentrate without irrelevant thoughts intruding.	❒	❒	❒	❒
61. My breathing is fast and shallow.	❒	❒	❒	❒
62. I worry that I cannot control my thoughts as well as I would like to.	❒	❒	❒	❒
63. I have butterflies in the stomach.	❒	❒	❒	❒
64. My palms feel clammy.	❒	❒	❒	❒

Section G. The following questions relate to your usual sleep habits during <u>the past month only</u>. Your answers should indicate the most accurate reply for the majority of days and nights in the past month. Please answer all questions, if possible.

Pittsburgh Sleep Quality Index (PSQI)

1. During the past month, when have you usually gone to bed at night?
   USUAL BEDTIME_____ A.M. / P.M. (please indicate A.M. or P.M.; note that 12 A.M. is midnight and 12 P.M. is noon)

2. During the past month, how long (in minutes) does it usually take you to fall asleep each night?
   NUMBER OF MINUTES_____

3. During the past month, when have you usually gotten up in the morning?
   USUAL GETTING UP TIME_____ A.M. / P.M. (please indicate A.M. or P.M.; note that 12 A.M. is midnight and 12 P.M. is noon)

4. During the past month, how many hours of *actual* sleep did you get at night? (This may be different than the number of hours you spend in bed).
   HOURS OF SLEEP PER NIGHT_____

For each of the remaining questions, check the one best response.

5. During the past month, how often have you had trouble sleeping because you…

   a. Cannot get to sleep within 30 minutes
      - ❒ Not during the past month
      - ❒ Less than once a week
      - ❒ Once or twice a week
      - ❒ Three or more times a week

   b. Wake up in the middle of the night or early morning
      - ❒ Not during the past month
      - ❒ Less than once a week
      - ❒ Once or twice a week
      - ❒ Three or more times a week

   c. Have to get up to use the bathroom
      - ❒ Not during the past month
      - ❒ Less than once a week
      - ❒ Once or twice a week
      - ❒ Three or more times a week

d. Cannot breathe comfortably
   - ❒ Not during the past month
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

e. Cough or snore loudly
   - ❒ Not during the past month
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

f. Feel too cold
   - ❒ Not during the past month
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

g. Feel too hot
   - ❒ Not during the past month
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

h. Had bad dreams
   - ❒ Not during the past month
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

i. Have pain
   - ❒ Not during the past month
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

j. Other reason(s), please describe
   _____

6. During the past month, how often have you taken medicine (prescribed or "over the counter") to help you sleep?
   - ❒ Not during the past month
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

7. During the past month, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?
    - ❒ Not during the past month
    - ❒ Less than once a week
    - ❒ Once or twice a week
    - ❒ Three or more times a week

8. During the past month, how much of a problem has it been for you to keep up enough enthusiasm to get things done?
    - ❒ No problem at all
    - ❒ Only a very slight problem
    - ❒ Somewhat of a problem
    - ❒ A very big problem

9. During the past month, how would you rate your sleep quality overall?
    - ❒ Very good
    - ❒ Fairly good
    - ❒ Fairly bad
    - ❒ Very bad

Appendix C

Part A: Recruitment Email

NIGHT EATING STUDY LOOKING FOR VOLUNTEERS!

Title: Night Eating, Affect, and Sleep Study

Researchers: Staci Person, M.A.
Ph.D. Clinical Psychology Candidate
(smperson@lakeheadu.ca)

Dr. Josephine Tan, Ph.D., C. Psych.
(jtan@lakeheadu.ca)

Do you snack at night? We would like to find out!

We are conducting a study to look at the link between night eating, stress, mood and sleep. The study involves filling out an online research questionnaire that asks about your eating habits and your functioning. This will take you no more than 60 minutes to complete. You must be a Lakehead University **student 18 years of age or older** to participate. You do not have to consider yourself a night eater in order to participate.

For more information on the study and/or to participate, please visit this weblink, **www.surveymonkey.com/r/nighteatingstudy1**. If you have questions please contact Staci Person (smperson@lakeheadu.ca). All responses are treated with the strictest confidentiality and participation is completely voluntary.

Random prize draws for $50.00 VISA gift certificates will be held for all participants. One (1) bonus point is offered to students enrolled in Introductory Psychology or other courses (where bonus points in return for research participation is permitted by the course instructor) at Lakehead University (Thunder Bay and Orillia campuses).

We will share a summary of our findings with you upon request. Lakehead University Research Ethics Board has approved this study.

Appendix D

Part A: Recruitment Advertisement

Receive **1 bonus point** towards a Lakehead University course (where permitted by course instructor) and be entered into draws for **$50.00 VISA gift cards**.

Participation involves:

- The completion of several online self-report measures that ask about your mood, sleep, and eating habits. This will take you no more than 60 minutes to complete. Participation is voluntary. Responses to the measures are kept confidential. To participate and/or to learn more about the study, please visit this weblink: **www.surveymonkey.com/r/nighteatingstudy1.**

Note. You do not have to consider yourself a night eater in order to participate in this study. We will share a summary of our findings with you upon request.

Lakehead UNIVERSITY

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Associate Professor/Project Supervisor
Department of Psychology

This study has received research ethics approval from Lakehead University (807-343-8283)

For more information, please email Staci at smperson@lakeheadu.ca

Appendix E

Part A: Cover Letter

NIGHT EATING, AFFECT, AND SLEEP STUDY

Dear Potential Participant,

We invite you to take part in our study. It is being conducted by Staci Person (smperson@lakeheadu.ca) who is a PhD Clinical Psychology student at Lakehead University, and by her dissertation supervisor, Dr. Josephine Tan (jtan@lakeheadu.ca).

We are interested in learning how several human functioning variables such as stress, mood, and quality of sleep relate to night eating. You must be at least 18 years of age to participate and currently enrolled at Lakehead University (Thunder Bay or Orillia campus). You *do not* have to be a night eater to participate in this study. We are looking for a wide range of people and would like to hear from those who do not eat at night to those who eat at night regularly.

This study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright from the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca.

For more information about the study, please click on the NEXT button below to go to the informed consent form.

NEXT

This study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright at the Research Ethics Board by calling 807-343-8283 or emailing research@lakeheadu.ca

Appendix F

Part A: Informed Consent Form

NIGHT EATING, AFFECT, AND SLEEP STUDY INFORMED CONSENT FORM

This page contains detailed information about the study that will enable you to make an informed decision about participating.

Title of Study: Night Eating, Affect, and Sleep Study.

Researchers: Staci Person (Ph.D. Clinical Psychology Candidate, Lakehead University). Dr. Josephine Tan (Supervisor, Lakehead University).

Aim of Study: The aim of this study is to understand how several human functioning variables such as stress, mood, and quality of sleep relate to night eating.

Procedure: In this study you will be asked to complete an online research questionnaire that asks about your mood, your experience of stress, and your eating and sleeping patterns. This will take you no more than 60 minutes to complete.

Risks/Benefits: There is no risk involved in participating in this study other than the fact that some individuals might feel uncomfortable answering some personal questions. Upon completion of this research questionnaire, you will be entered into a random prize draw for a chance to win one of two $50.00 VISA gift cards. Additionally, if you are a Lakehead University Introductory Psychology student, you will receive 1 bonus point to go towards your course mark (other courses might apply if the course instructor permits credit for research participation). Participants who are ineligible or who do not wish to obtain bonus points will receive an extra entry into the random prize draws.

Confidentiality: All data collected will be kept strictly confidential and your responses to the questionnaire will be completely anonymous. There will be no digital link between the consent form (where identifiable information is collected) and the research questionnaire. The online survey tool used in the study, SurveyMonkey, is hosted by a server located in the United States. The U.S. Patriot Act permits U.S. law enforcement officials, for the purpose of anti-terrorism investigation, to seek a court order that allows access to the personal records of any person without the person's knowledge. In view of this we cannot absolutely guarantee the full confidentiality and anonymity of your data. With your consent to participate in this study, you acknowledge this. All data stored on SurveyMonkey will be deleted as soon as the researchers have downloaded it. This information will only be accessed by the researchers,

who have been trained in research ethics. The downloaded data will be securely stored in Dr. Tan's lab for at least 5 years, after which time it will be destroyed. The data will be encrypted during storage on a computer that is password protected and located in Dr. Tan's lab which is locked at all times.

Voluntary Nature: Your participation is completely voluntary. You are free to withdraw from, or choose not to answer specific questions, at any time without explanation or penalty. However, once you have begun the questionnaire, the researchers will not be able to identify your questionnaire to delete it because your questionnaire will not contain any information that can be traced back to you.

Data Dissemination: You can request for a summary of the results, which you will receive after the study has been completed. As well, the results of this study will be disseminated via conference presentations and in scientific publications. However, no identifying information will be associated with the data, which will be presented collectively, not individually.

Please provide your name and contact information below so that we can reach you if you are a winner in one of the random prize draws:

Name: _____

Email: _____

Telephone: _____

If you are a student in an Introductory Psychology course or in another course at Lakehead University Thunder Bay or Orillia campus where your instructor permits you to receive bonus points for research participation, please provide us with the information below so that we can make sure that you receive your credit.

Student ID Number: _____

Professor's Name: _____

Course Number and Name: _____

Campus: ❒ Thunder Bay ❒ Orillia

If you wish to receive a summary copy of the results when the study has been completed, please provide us with your email address or mailing address below. We anticipate that the results will be available early 2020.

_____

_____

To start this study, please click the NEXT button below. This will take you to the research questionnaire which is hosted on a separate weblink.

By clicking the "NEXT" button you are indicating that you have fully read and understood the information stated above, and that you wish to participate in this study on a voluntary basis.

NEXT

Appendix G

Part A: Debriefing Form

NIGHT EATING, AFFECT, AND SLEEP STUDY DEBRIEFING FORM

Thank you for participating in this study. Before you leave, we would like to offer you additional information. We were not able to provide you with a lot of information about the study before completion of the survey because we did not want to influence your responses in light of what you think we expected to find.

In this study, we were examining how several variables such as stress, stress coping, mood, and quality of sleep relate to night eating behaviours among students. Some individuals eat a large amount of food after their evening meal before bedtime and/or during awakenings at night. It is also common for these individuals to experience stress, mood that worsens in the evening, and difficulty falling or staying asleep, but whether that varies with the severity of night eating is something we do not know and would like to find out. We were also interested in finding out whether rumination, the act of thinking about problems over and over again, might have anything to do with psychological distress among night eaters.

We anticipate that the results will be ready early 2020. If you had requested a summary of the results earlier, a copy will be sent to your email (or mailing address, if preferred). If you did not and would now like a copy, just email us – our contact information is at the bottom of this page.

We want to reassure you that your responses will be kept confidential. We will be holding the draw for the two $50.00 VISA gift cards at the end of the 2019. If you win, we will contact you. If you are an Introductory Psychology student at Lakehead University or enrolled in other courses where the instructor permits bonus points, you will be given one bonus point towards your course mark.

Please do not mention the purpose of this study to anyone. Many people have not yet participated in the study and we do not wish to influence their answers with the prior information as it would affect the validity of our findings. We hope that you will cooperate with us in this regard. We sincerely thank you.

If you indicated your interest in Part B and are deemed eligible to participate, we will contact you with more information later this semester or early summer.

Do you have any questions for us? If yes, please contact us:

Staci Person, M.A.
Ph.D. Clinical Psychology Candidate
Department of Psychology
(smperson@lakeheadu.ca)

Josephine Tan, Ph.D., C. Psych.
Associate Professor/Project Supervisor
Department of Psychology
(jtan@lakeheadu.ca)

Thank you for helping us with this project, it would not have been possible without your assistance. Below you will find a listing of **community mental health resources** that you can keep for your own information or relay to anyone who might be interested in the list. Counseling services are available for individuals who require assistance coping with stress and regaining control of their lives. Issues may concern academic performance, personal relationships, mental health, occupational functioning, thoughts or intentions of harming one's self, etc.

- Student Health and Counseling Centre – *free* counseling for all Lakehead University students: located in Prettie Residence building, (807) 343-8361
- Mental Health Assessment Team – emergency services available from the Thunder Bay Regional Health Sciences Centre (TBRHSC)
- Family physicians or walk-in clinic physicians can be consulted for a referral for mental health resources (e.g., Mental Health Outpatient Programs at St. Joseph's Care Group or TBRHSC)
- Anishnawbe Mushkiki: counselling services for First Nations individuals, couples, and families: (807) 623-0383
- Thunder Bay Counseling Centre: counselling for individuals, couples, and families: (807) 684-1880 – fee for service
- Self-referral to any mental health professional in private practice (look up the Yellow Pages under *Psychologists and Psychological Associates; Psychotherapy; or Marriage, Family & individual Counsellors*) – fee for service
- Thunder Bay Crisis Response Service: (807) 346-8282
- Ontario Mental Health Helpline: 1-866-531-2600
- Ontario Drug and Alcohol Helpline: 1-800-565-8603
- More information is available at Thunder Bay Canadian Mental Health Association: (807) 345-5564

- Student Health and Wellness Centre – *free* counseling for all Lakehead University students: located in OA 1012, +1(705) 330-4008 ext. 2115
- 24-Hour Mental Health Crisis Line: (705) 728-5044
- Rape Crisis/Sexual Assault Centre: 1-800-987-0799
- Telecare Distress Line: (705) 325-9534
- Orillia Soldiers' Memorial: (705) 325-2201
- After Hours Medical Clinic: (705) 327-0578
- ConnexOntario – Drug and Alcohol Helpline: 1-800-565-8603
- Mental Health Helpline: 1-866-531-2600
- Good2Talk: 1-866-925-5454

Appendix H

Part B: Screening Questionnaire

Participating in this study involves a commitment of time and energy. If you qualify and choose to participate you will be asked to do a number of things such as filling out self-report measures including food and sleep diaries, attending four mindfulness sessions, and completing home practice in between these sessions. Please answer the following questions:

1. Are you willing to complete an online self-report questionnaire package on two separate occasions (each taking no more than 60 minutes to complete)?
   ❒ Yes ❒ No

2. Are you willing to attend four free 1.5-hour mindfulness group sessions once a week for four consecutive weeks?
   ❒ Yes ❒ No

3. Are you physically able to attend these group sessions which will be held on Lakehead University Thunder Bay campus during the afternoons or evenings?
   ❒ Yes ❒ No

4. The benefits of mindfulness training requires the completion of daily homework exercises. Are you able and willing to practice on your own daily mindfulness exercises that ranges from 3 to 40 minutes on the days that are in-between group sessions for the duration of the 4-week study?
   ❒ Yes ❒ No

5. Have you had any prior training in mindfulness? ❒ Yes ❒ No

   IF YES, please specify [e.g., an 8-week mindfulness-based cognitive therapy (MBCT) or mindfulness-based stress reduction (MBSR) course]:

   IF YES, was this within the last 4 weeks? ❒ Yes ❒ No

6. Are you currently engaging in meditation exercises? ❒ Yes ❒ No

   IF YES, how often do you do it? _____

   IF YES, when was the last time you mediated? _____

This section asks for your demographic information. This is for statistical purposes so that we may know the composition of the people in our study.

Age: _____

Biological Sex: ❒ Male ❒ Female ❒ Other

What is your height in inches? _____

What is your weight in pounds? _____

Are you a student? ❒ Yes ❒ No

IF YES, what is your educational level?

- ❒ Less than a high school diploma
- ❒ Graduated high school or high school equivalent
- ❒ Current College undergraduate student
- ❒ Current University undergraduate student
- ❒ Current graduate or doctoral student
- ❒ Completed graduate school

Relationship Status:

- ❒ Not in a relationship
- ❒ In a relationship
- ❒ Common-law partner
- ❒ Married partner

IF in a relationship, are you currently living with your partner?

- ❒ Yes
- ❒ No

Ethnicity, please check one:

- ❒ Aboriginal
- ❒ White (origins in Europe, North Africa, Middle East, not of Hispanic origin)
- ❒ Black (origins in Africa, not of Hispanic origin)
- ❒ Asian/Pacific Islander (origins in Far East, Southeast Asia, India Subcontinent, Pacific Islands)
- ❒ Latino or Hispanic (Mexican, Puerto Rican, Cuban, Central or South America, or other Spanish culture or origin)
- ❒ Other, please specify: _____

Do you ***currently*** have a diagnosis of depression provided by a registered health care provider, (e.g., physician, psychologist, psychiatrist or nurse practitioner)?

❒ Yes
❒ No

IF YES, are you currently receiving treatment for it (i.e., taking antidepressants)?

❒ Yes
❒ No

Please review the list below. Do one or more of these things ***currently*** apply to you?

- I am pregnant
- I work regular or rotating night shifts
- I have a diagnosed sleep disorder other than insomnia (i.e., sleep apnea)
- I have a diagnosed substance use disorder
- I have a diagnosed eating disorder (anorexia nervosa, bulimia nervosa, or binge eating disorder)
- I have a current or past diagnosis of a psychotic disorder (e.g., delusional disorder, brief psychotic disorder, schizophreniform disorder, schizophrenia, schizoaffective disorder)
- I experienced a psychological trauma in the past that still affects me today
- I am receiving psychotherapy
- I am taking psychiatric medications

❒ None of the above applies to me
❒ At least one of the above applies to me

The purpose of this form is to find out more about your eating and sleeping patterns. Please choose one answer for each question.

1. How hungry are you usually in the morning?
   - ❒ Not at all
   - ❒ A little
   - ❒ Somewhat
   - ❒ Moderately
   - ❒ Very

2. When do you usually eat for the first time?
   - ❒ Before 9 am
   - ❒ 9:01 am to 12 (noon)
   - ❒ 12:01 noon to 3 pm
   - ❒ 3:01 pm to 6 pm
   - ❒ 6:01 pm or later

3. Do you have cravings or urges to eat snacks after supper, but before bedtime?
   - ❒ Not at all
   - ❒ A little
   - ❒ Somewhat
   - ❒ Very much so
   - ❒ Extremely so

4. How much control do you have over your eating between supper and bedtime?
   - ❒ None at all
   - ❒ A little
   - ❒ Some
   - ❒ Very much
   - ❒ Complete

5. How much of your daily food intake do you consume after suppertime?
   - ❒ 0% (none)
   - ❒ 1–25% (up to a quarter)
   - ❒ 26–50% (about half)
   - ❒ 51–75% (more than half)
   - ❒ 76–100% (almost all)

6. Are you currently feeling blue or down in the dumps?
   - ❒ Not at all
   - ❒ A little
   - ❒ Somewhat
   - ❒ Very much so
   - ❒ Extremely

7. When you are feeling blue, is your mood lower in the:
   - ❒ Early morning
   - ❒ Late morning
   - ❒ Afternoon
   - ❒ Early evening
   - ❒ Late evening/nighttime

   ____check if your mood does not change during the day

8. How often do you have trouble getting to sleep?
   - ❒ Never
   - ❒ Sometimes
   - ❒ About half the time
   - ❒ Usually
   - ❒ Always

9. Other than only to use the bathroom, how often do you get up at least once in the middle of the night?
   - ❒ Never
   - ❒ Less than once a week
   - ❒ About once a week
   - ❒ More than once a week
   - ❒ Every night

********** IF "Never" on #9, PLEASE STOP HERE **********

10. Do you have cravings or urges to eat snacks when you wake up at night?
    - ❒ Not at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Extremely so

11. Do you need to eat in order to get back to sleep when you awake at night?
    - ❒ Not at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Extremely so

12. When you get up in the middle of the night, how often do you snack?
    - ❒ Never
    - ❒ Sometimes
    - ❒ About half the time
    - ❒ Usually
    - ❒ Always

********** IF "Never" on #12, PLEASE STOP HERE **********

13. When you snack in the middle of the night, how aware are you of your eating?
    - ❒ Not at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Completely

14. How much control do you have over your eating while you are up at night?
    - ❒ None at all
    - ❒ A little
    - ❒ Some
    - ❒ Very much
    - ❒ Complete

How long have your current difficulties with night eating been going on?

_____ months _____ years

15. How upsetting is your night eating to you?
    - ❒ Not at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Extremely

16. How much has your night eating affected your life?
    - ❒ Not at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Extremely

Appendix I

Part B: Research Questionnaire

Section A. People have a variety of ways of relating to their thoughts and feelings. For each of the items below, please rate how much each applies to you <u>in the past week.</u>

Cognitive & Affective Mindfulness Scale-Revised (CAMS-R)

1 Rarely/Not at all	**2** Sometimes	**3** Often	**4** Almost always

	1	2	3	4
1. It is easy for me to concentrate on what I am doing.	❒	❒	❒	❒
2. I am preoccupied by the future.	❒	❒	❒	❒
3. I can tolerate emotional pain.	❒	❒	❒	❒
4. I can accept things I cannot change.	❒	❒	❒	❒
5. I can usually describe how I feel at the moment in considerable detail.	❒	❒	❒	❒
6. I am easily distracted.	❒	❒	❒	❒
7. I am preoccupied by the past.	❒	❒	❒	❒
8. It's easy for me to keep track of my thoughts and feelings.	❒	❒	❒	❒
9. I try to notice my thoughts without judging them.	❒	❒	❒	❒
10. I am able to accept the thoughts and feelings I have.	❒	❒	❒	❒
11. I am able to focus on the present moment.	❒	❒	❒	❒
12. I am able to pay close attention to one thing for a long period of time.	❒	❒	❒	❒

Section B. The purpose of this form is to find out more about your eating and sleeping patterns. Please refer to your experiences during the past week.

Night Eating Symptom Scale (NESS)

1. How hungry were you in the morning during the past week?
   - ❒ Not at all
   - ❒ A little
   - ❒ Somewhat
   - ❒ Moderately
   - ❒ Very

2. When did you usually eat for the first time each day?
   - ❒ Before 9 am
   - ❒ 9:01 am to 12 pm (noon)
   - ❒ 12:01 noon to 3 pm
   - ❒ 3:01 pm to 6 pm
   - ❒ 6:01 pm or later

3. Did you have cravings or urges to eat snacks after supper, but before bedtime this week?
   - ❒ None at all
   - ❒ A little
   - ❒ Somewhat
   - ❒ Very much so
   - ❒ Extremely so

4. How much control did you have over your eating between supper and bedtime?
   - ❒ None at all
   - ❒ A little
   - ❒ Some
   - ❒ Very much
   - ❒ Complete

5. How much of your daily food intake did you consume after suppertime?
   - ❒ 0% (none)
   - ❒ 1–25% (up to a quarter)
   - ❒ 26–50% (about half)
   - ❒ 51–75% (more than half)
   - ❒ 76–100% (almost all)

6. How often did you have trouble getting to sleep this week?
   - ❒ Never
   - ❒ 1-2 times
   - ❒ 3-4 times
   - ❒ 5-6 times
   - ❒ Every night

7. How many times *total* did you get up in the middle of the night *in the past week*?
   _____ # times whole week

8. When you got up in the middle of the night, how many times *total* did you snack *in the past week*?
   _____ # times whole week

9. Did you have cravings or urges to eat snacks when you woke up at night this week?
   - ❒ None at all
   - ❒ A little
   - ❒ Somewhat
   - ❒ Very much so
   - ❒ Extremely so

10. When you were up at night this week, how much did you need to eat in order to get back to sleep?
    - ❒ None at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Extremely so ____check here if you did not get up

11. How much control did you have over your eating while you are up at night?
    - ❒ None at all
    - ❒ A little
    - ❒ Some
    - ❒ Very much
    - ❒ Complete ____check here if you did not get up

12. Were you currently feeling blue or down in the dumps this week?
    - ❒ Not at all
    - ❒ A little
    - ❒ Somewhat
    - ❒ Very much so
    - ❒ Extremely so

13. When you were feeling blue, was your mood lower in the:
    - ❒ Early morning
    - ❒ Late morning
    - ❒ Afternoon
    - ❒ Early evening
    - ❒ Late evening/nighttime ____check here if you did not feel blue at all

Section C. The questions in this scale ask you about your thoughts and feelings. In each case, you are asked to indicate how often you felt or thought a certain way <u>in the past week</u>.

Perceived Stress Scale (PSS)

0	**1**	**2**	**3**	**4**
Never	Almost never	Sometimes	Fairly often	Very often

	0	1	2	3	4
1. In the past week, how often have you been upset because of something that happened unexpectedly?	❒	❒	❒	❒	❒
2. In the past week, how often have you felt that you were unable to control the important things in your life?	❒	❒	❒	❒	❒
3. In the past week, how often have you felt nervous and stressed?	❒	❒	❒	❒	❒
4. In the past week, how often have you felt confident about your ability to handle your personal problems?	❒	❒	❒	❒	❒
5. In the past week, how often have you felt that things were going your way?	❒	❒	❒	❒	❒
6. In the past week, how often have you found that you could not cope with all the things you had to do?	❒	❒	❒	❒	❒
7. In the past week, how often have you been able to control irritations in your life?	❒	❒	❒	❒	❒
8. In the past week, how often have felt you were on top of things?	❒	❒	❒	❒	❒
9. In the past week, how often have you been angered because of things that happened that were outside your control?	❒	❒	❒	❒	❒
10. In the past week, how often have you felt difficulties were piling up so high that you could not overcome them?	❒	❒	❒	❒	❒

Section D. Please read each of the items below and indicate whether you almost never, sometimes, often, or almost always think or do each one when you feel down, sad, or depressed. Please rate how well the item describes you during the past week.

Ruminative Responses Scale (RRS)

1 Almost Never	**2** Sometimes	**3** Often	**4** Almost Always

	1	2	3	4
1. Think about how alone you feel.	❒	❒	❒	❒
2. Think "I won't be able to do my job if I don't snap out of this."	❒	❒	❒	❒
3. Think about your feelings of fatigue and achiness.	❒	❒	❒	❒
4. Think about how hard it is to concentrate.	❒	❒	❒	❒
5. Think "What am I doing to deserve this?"	❒	❒	❒	❒
6. Think about how passive and unmotivated you feel.	❒	❒	❒	❒
7. Analyze recent events to try to understand why you are depressed.	❒	❒	❒	❒
8. Think about how you don't seem to feel anything anymore.	❒	❒	❒	❒
9. Think "Why can't I get going?"	❒	❒	❒	❒
10. Think "Why do I always react this way?"	❒	❒	❒	❒
11. Go away by yourself and think about why you feel this way.	❒	❒	❒	❒
12. Write down what you are thinking about and analyze it.	❒	❒	❒	❒
13. Think about a recent situation, wishing it had gone better.	❒	❒	❒	❒
14. Think "I won't be able to concentrate if I keep feeling this way."	❒	❒	❒	❒
15. Think "Why do I have problems other people don't have?"	❒	❒	❒	❒
16. Think "Why can't I handle things better?"	❒	❒	❒	❒
17. Think about how sad you feel.	❒	❒	❒	❒
18. Think about all your shortcomings, failings, faults, and mistakes.	❒	❒	❒	❒
19. Think about how you don't feel up to doing anything.	❒	❒	❒	❒
20. Analyze your personality to try to understand why you are depressed.	❒	❒	❒	❒
21. Go someplace alone to think about your feelings.	❒	❒	❒	❒
22. Think about how angry you are with yourself.	❒	❒	❒	❒

Section E. Compared to how you feel when you are in an even or normal mood state, how would you rate yourself on the following items during the past week?

Hamilton Depression Rating Scale (HDRS)

0 Not at all
1 Just a little
2 More than just a little
3 Quite a bit: moderately
4 Marked or severely

During the past week I have felt…	0	1	2	3	4
1. Down and depressed	❒	❒	❒	❒	❒
2. Less interested in doing things	❒	❒	❒	❒	❒
3. Less interested in sex	❒	❒	❒	❒	❒
4. Less interested in eating	❒	❒	❒	❒	❒
5. That I've lost some weight	❒	❒	❒	❒	❒
6. That I can't fall asleep at night	❒	❒	❒	❒	❒
7. That my sleep is restless	❒	❒	❒	❒	❒
8. That I wake up too early	❒	❒	❒	❒	❒
9. Heavy in my limbs or aches in back, muscles, or head, more tired than usual	❒	❒	❒	❒	❒
10. Guilty or like a failure	❒	❒	❒	❒	❒
11. Wishing for death or suicidal	❒	❒	❒	❒	❒
12. Tense, irritable, or worried	❒	❒	❒	❒	❒
13. Sure I'm ill or have a disease	❒	❒	❒	❒	❒
14. That my speech and thoughts are slow	❒	❒	❒	❒	❒
15. Fidgety, restless, or antsy	❒	❒	❒	❒	❒
16. That morning is worse than evening	❒	❒	❒	❒	❒
17. That evening is worse than morning	❒	❒	❒	❒	❒
18. Unreal or in a dream state	❒	❒	❒	❒	❒
19. Suspicious of people/paranoid	❒	❒	❒	❒	❒
20. Preoccupied/obsessed that I must check things a lot	❒	❒	❒	❒	❒
21. Physical symptoms when worried	❒	❒	❒	❒	❒

Section F. Below is a list of statements, which can be used to describe how people feel. Beside each statement are four numbers to indicate the degree to which the statement is self-descriptive of your mood (e.g., 1 = not at all, 4 = very much so). Please read each statement carefully and choose the number that best indicates how <u>you feel right now</u>, at this very moment, even if this is not how you usually feel.

State-Trait Inventory for Cognitive and Somatic Anxiety (STICSA)
~ State ~

1	**2**	**3**	**4**
Not at all	A little	Moderately	Very much so

	1	2	3	4
1. My heart beats fast.	❒	❒	❒	❒
2. My muscles are tense.	❒	❒	❒	❒
3. I feel agonized over my problems.	❒	❒	❒	❒
4. I think that others won't approve of me.	❒	❒	❒	❒
5. I feel like I'm missing out on things because I can't make up my mind soon enough.	❒	❒	❒	❒
6. I feel dizzy.	❒	❒	❒	❒
7. My muscles feel weak.	❒	❒	❒	❒
8. I feel trembly and shaky.	❒	❒	❒	❒
9. I picture some future misfortune.	❒	❒	❒	❒
10. I can't get some thoughts out of my mind.	❒	❒	❒	❒
11. I have trouble remembering things.	❒	❒	❒	❒
12. My face feels hot.	❒	❒	❒	❒
13. I think that the worst will happen.	❒	❒	❒	❒
14. My arms and legs feel stiff.	❒	❒	❒	❒
15. My throat feels dry.	❒	❒	❒	❒
16. I keep busy to avoid uncomfortable thoughts.	❒	❒	❒	❒
17. I cannot concentrate without irrelevant thoughts intruding.	❒	❒	❒	❒
18. My breathing is fast and shallow.	❒	❒	❒	❒
19. I worry that I cannot control my thoughts as well as I would like to.	❒	❒	❒	❒
20. I have butterflies in the stomach.	❒	❒	❒	❒
21. My palms feel clammy.	❒	❒	❒	❒

Section G. The following questions relate to your usual sleep habits during <u>the past week only</u>. Your answers should indicate the most accurate reply for the majority of days and nights in the past week. Please answer all questions, if possible.

Pittsburgh Sleep Quality Index (PSQI)

1. During the past week, when have you usually gone to bed at night?
   USUAL BEDTIME_____ A.M. / P.M. (please indicate A.M. or P.M.; note that 12 A.M. is midnight and 12 P.M. is noon)

2. During the past week, how long (in minutes) does it usually take you to fall asleep each night?
   NUMBER OF MINUTES_____

3. During the past week, when have you usually gotten up in the morning?
   USUAL GETTING UP TIME_____ A.M. / P.M. (please indicate A.M. or P.M.; note that 12 A.M. is midnight and 12 P.M. is noon)

4. During the past week, how many hours of *actual* sleep did you get at night? (This may be different than the number of hours you spend in bed).
   HOURS OF SLEEP PER NIGHT_____

For each of the remaining questions, check the one best response.

5. During the past week, how often have you had trouble sleeping because you…

   a. Cannot get to sleep within 30 minutes
      - ❒ Not during the past week
      - ❒ Less than once a week
      - ❒ Once or twice a week
      - ❒ Three or more times a week

   b. Wake up in the middle of the night or early morning
      - ❒ Not during the past week
      - ❒ Less than once a week
      - ❒ Once or twice a week
      - ❒ Three or more times a week

   c. Have to get up to use the bathroom
      - ❒ Not during the past week
      - ❒ Less than once a week
      - ❒ Once or twice a week
      - ❒ Three or more times a week

d. Cannot breathe comfortably
   - ❒ Not during the past week
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

e. Cough or snore loudly
   - ❒ Not during the past week
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

f. Feel too cold
   - ❒ Not during the past week
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

g. Feel too hot
   - ❒ Not during the past week
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

h. Had bad dreams
   - ❒ Not during the past week
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

i. Have pain
   - ❒ Not during the past week
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

j. Other reason(s), please describe
   _____

6. During the past week, how often have you taken medicine (prescribed or "over the counter") to help you sleep?
   - ❒ Not during the past week
   - ❒ Less than once a week
   - ❒ Once or twice a week
   - ❒ Three or more times a week

7. During the past week, how often have you had trouble staying awake while driving, eating meals, or engaging in social activity?
    - ❒ Not during the past week
    - ❒ Less than once a week
    - ❒ Once or twice a week
    - ❒ Three or more times a week

8. During the past week, how much of a problem has it been for you to keep up enough enthusiasm to get things done?
    - ❒ No problem at all
    - ❒ Only a very slight problem
    - ❒ Somewhat of a problem
    - ❒ A very big problem

9. During the past week, how would you rate your sleep quality overall?
    - ❒ Very good
    - ❒ Fairly good
    - ❒ Fairly bad
    - ❒ Very bad

Section H. Record on the Home Practice Record Form each time you practice mindfulness. Also, make a note of anything that comes up in the home practice, so that we can talk about it at the next session.

HOME PRACTICE RECORD FORM WEEK ONE

Participant Code: _____

Date	**Practice (Yes/No)**	**Duration of Exercise**	**Comments**
Day 1:	Body Scan: Mindful Eating: Routine Activity:	Minutes: Minutes: Y N	
Day 2:	Body Scan: Mindful Eating: Routine Activity:	Minutes: Minutes: Y N	
Day 3:	Body Scan: Mindful Eating: Routine Activity:	Minutes: Minutes: Y N	
Day 4:	Body Scan: Mindful Eating: Routine Activity:	Minutes: Minutes: Y N	
Day 5:	Body Scan: Mindful Eating: Routine Activity:	Minutes: Minutes: Y N	
Day 6:	Body Scan: Mindful Eating: Routine Activity:	Minutes: Minutes: Y N	
Day 7:	Body Scan: Mindful Eating: Routine Activity:	Minutes: Minutes: Y N	

HOME PRACTICE RECORD FORM WEEK TWO

Participant Code: _____

Date	**Practice (Yes/No)**	**Duration of Exercise**	**Comments**
Day 1:	Breath: 3-Minute Breathing Space: Un/Pleasant Experiences:	Minutes: X X X Y N	
Day 2:	Breath: 3-Minute Breathing Space: Un/Pleasant Experiences:	Minutes: X X X Y N	
Day 3:	Breath: 3-Minute Breathing Space: Un/Pleasant Experiences:	Minutes: X X X Y N	
Day 4:	Breath: 3-Minute Breathing Space: Un/Pleasant Experiences:	Minutes: X X X Y N	
Day 5:	Breath: 3-Minute Breathing Space: Un/Pleasant Experiences:	Minutes: X X X Y N	
Day 6:	Breath: 3-Minute Breathing Space: Un/Pleasant Experiences:	Minutes: X X X Y N	
Day 7:	Breath: 3-Minute Breathing Space: Un/Pleasant Experiences:	Minutes: X X X Y N	

HOME PRACTICE RECORD FORM WEEK THREE

Participant Code: _____

Date	Practice (Yes/No)	Duration of Exercise	Comments
Day 1:	Stretch and Breath: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X	
Day 2:	Mindful Movement: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X	
Day 3:	Stretch and Breath: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X	
Day 4:	Mindful Movement: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X	
Day 5:	Stretch and Breath: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X	
Day 6:	Mindful Movement: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X	
Day 7:	Mindful Movement: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X	

HOME PRACTICE RECORD FORM WEEK FOUR

Participant Code: _____

Date	Practice (Yes/No)	Duration of Exercise	Comments
Day 1:	Working with Difficulty: 3-Minute Breathing Space: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X X X X	
Day 2:	Sitting with Silence: 3-Minute Breathing Space: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X X X X	
Day 3:	Working with Difficulty: 3-Minute Breathing Space: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X X X X	
Day 4:	Sitting with Silence: 3-Minute Breathing Space: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X X X X	
Day 5:	Working with Difficulty: 3-Minute Breathing Space: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X X X X	
Day 6:	Sitting with Silence: 3-Minute Breathing Space: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X X X X	
Day 7:	Working with Difficulty: 3-Minute Breathing Space: 3-Minute Responsive Breathing Space:	Minutes: X X X X X X X X X X X X X	

Appendix J

Part B: Recruitment Email A

MINDFULNESS STUDY LOOKING FOR VOLUNTEERS

Title: Mindfulness, Night Eating, Affect, and Sleep

Researchers: Staci Person, M.A.
Ph.D. Clinical Psychology Candidate
(smperson@lakeheadu.ca)

Dr. Josephine Tan, Ph.D., C. Psych.
(jtan@lakeheadu.ca)

Are you still interested in free mindfulness sessions!

Earlier this semester you participated in our study entitled "Night Eating, Affect, and Sleep" by filling out an online research questionnaire that asked about your mood, and eating and sleeping patterns. Afterwards you indicated that you were interested in being contacted to learn more about our mindfulness study.

This study looks at the link between mindfulness and night eating behaviours. Participants will complete online research questionnaires that ask about their eating habits and their functioning and attend group mindfulness sessions. Entries into different random prize draws for $25.00, $50.00, and $200.00 VISA gift cards and up to 2 bonus points in courses (where permitted by course instructors) are available to participants.

For more information on the study and/or to participate, please visit the following weblink, **www.surveymonkey.com/r/nighteatingstudy2**. Several short screening items apply to ensure that this study is a good fit for you. If you have questions please contact Staci Person (smperson@lakeheadu.ca). All responses are treated with the strictest confidentiality and participation is completely voluntary.

We will share a summary of our findings with you upon request. Lakehead University Research Ethics Board has approved this study.

Appendix K

Part B: Recruitment Email B

MINDFULNESS STUDY LOOKING FOR VOLUNTEERS

Title: Mindfulness, Night Eating, Affect, and Sleep

Researchers: Staci Person, M.A.
Ph.D. Clinical Psychology Candidate
(smperson@lakeheadu.ca)

Dr. Josephine Tan, Ph.D., C. Psych.
(jtan@lakeheadu.ca)

Are you interested in free mindfulness sessions?

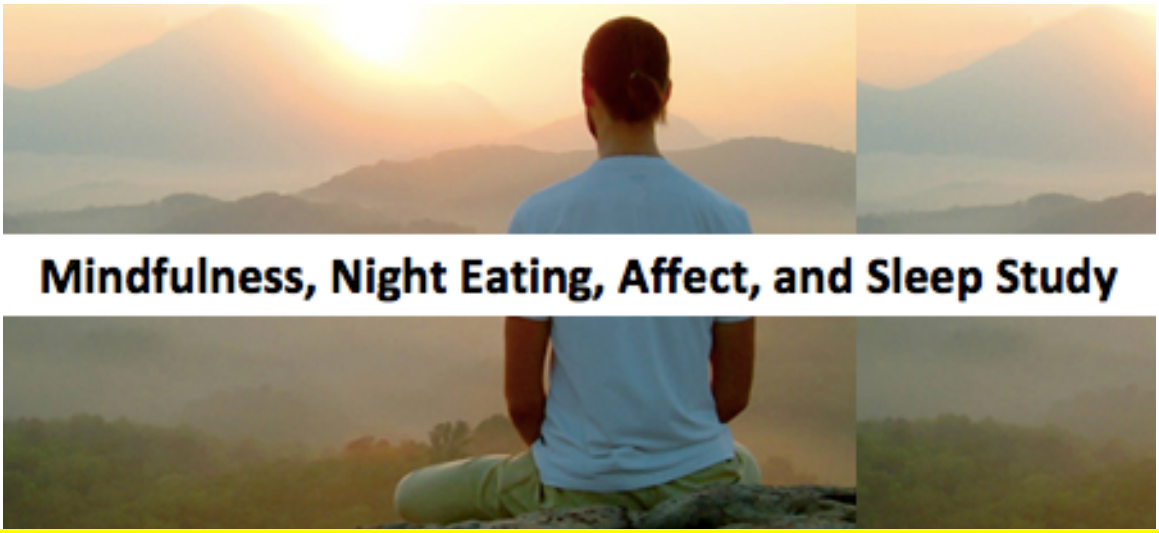
We are offering free mindfulness sessions as part of a research study that looks at the link between mindfulness and night eating behaviours. You must be a Lakehead University **student 18 years of age or older** to participate. Participants will complete online research questionnaires that ask about their eating habits and their functioning and attend group mindfulness sessions. Entries into different random prize draws for $25.00, $50.00, and $200.00 VISA gift cards and up to 2 bonus points in courses (where permitted by course instructors) are available to participants.

For more information on the study and/or to participate, please visit the following weblink, **www.surveymonkey.com/r/nighteatingstudy2**. Several short screening items apply to ensure that this study is a good fit for you. If you have questions please contact Staci Person (smperson@lakeheadu.ca). All responses are treated with the strictest confidentiality and participation is completely voluntary.

We will share a summary of our findings with you upon request. Lakehead University Research Ethics Board has approved this study.

Appendix L

Part B: Recruitment Advertisement



Receive up to **2 bonus points** toward a Lakehead University course (where permitted by course instructor) and be entered into different draws for **$25.00, $50.00 & $200.00 VISA gift cards.**

Lakehead University students who are **18 years of age or older** can participate.

Participation involves:

- **The completion of a brief 5-15 minute online screening questionnaire.**
- **Participation in a 4-week mindfulness group, and completion of self-report measures that ask about your eating habits and your functioning.**

To participate and/or to learn more about the study, please visit the following link **www.surveymonkey.com/r/nighteatingstudy2**.

We will share a summary of our findings with you upon request.

Staci Person, M.A.
Ph.D. Clinical Psychology Candidate
Department of Psychology

Dr. Josephine Tan, Ph.D., C. Psych.
Associate Professor/Project Supervisor
Department of Psychology

This study has received research ethics approval from Lakehead University (807-343-8283)

For more information, please email Staci at smperson@lakeheadu.ca

Appendix M

Part B: Cover Letter

MINDFULNESS, NIGHT EATING, AFFECT, AND SLEEP STUDY SCREENING QUESTIONNAIRE

Dear Potential Participant,

We invite you to take part in our study. It is being conducted by Staci Person (smperson@lakeheadu.ca) who is a PhD Clinical Psychology student at Lakehead University, and by her dissertation supervisor, Dr. Josephine Tan (jtan@lakeheadu.ca).

We are interested in learning how several human functioning variables such as stress coping, mood, quality of sleep, and mindfulness relate to night eating. You must be at least 18 years of age to participate and currently enrolled at Lakehead University (Thunder Bay campus only).

This is a brief screening questionnaire to ensure that the study is a right fit for you. This screening questionnaire will ask you for some demographic and background information, whether you are willing to complete certain tasks in the main study, and about your current eating and sleeping patterns. If you qualify for the main study, you will be invited to participate in it. During the main study, individuals will be asked to do the following: (i) complete a research questionnaire on stress coping, mood, and eating and sleeping patterns on two separate occasions, (ii) attend free weekly 1.5-hour mindfulness sessions on Lakehead University campus for four consecutive weeks, and (iii) practice daily mindfulness skills outside of the group sessions, and document it.

If you are invited to participate in the main study, you are not obligated to accept the invitation.

Both the screening and the main study have been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright from the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca.

For more information about this screening procedure, please click on the NEXT button below to go to the informed consent form.

NEXT

Appendix N

Part B: Consent Form A

MINDFULNESS, NIGHT EATING, AFFECT, AND SLEEP STUDY SCREENING QUESTIONNAIRE

Title of Study: Mindfulness, Night Eating, Affect, and Sleep Study.

Researchers: Staci Person (Ph.D. Clinical Psychology Candidate, Lakehead University). Dr. Josephine Tan (Supervisor, Lakehead University).

Aim of Study: The aim of this questionnaire is to screen for potential participants who are eligible for participation in the main study that looks at how several variables such as stress coping, mood, quality of sleep, and mindfulness relate to night eating.

Procedure: In this screening, you will be asked to complete a brief questionnaire to ensure that the study is a right fit for you. This should take you approximately 10-15 minutes to complete. Upon completion of this screening questionnaire, you will be entered into a random prize draw for a chance to win a $25.00 VISA gift card. If you qualify for further participation you will be invited to take part in the main study, which was described previously in the cover letter. Completing this screening does not commit you to participate in the main study if invited.

Risks/Benefits: There is no obvious risk involved in participating in this screening other than the fact that some individuals might feel uncomfortable answering some personal questions. Benefits include learning about research processes first-hand and knowledge that you are contributing to the advancement of research.

Confidentiality: All data collected will be kept strictly confidential. However, your name and contact information is requested so that you can be contacted to participate in the main portion of this study (if you qualify). Data will be coded with a number so that contact information can be destroyed after completion of the study to render all responses anonymous. The online survey tool used in the study, SurveyMonkey, is hosted by a server located in the United States. The US Patriot Act permits U.S. law enforcement officials, for the purpose of anti-terrorism investigation, to seek a court order that allows access to the personal records of any person without the person's knowledge. In view of this we cannot absolutely guarantee the full confidentiality and anonymity of your data. With your consent to participate in this study, you acknowledge this. All data stored on SurveyMonkey will be deleted as soon as the researchers have downloaded it. This downloaded data will be securely

stored in Dr. Tan's lab for 5 years, after which time it will be destroyed. The data will be encrypted during storage on a computer that is password protected and located in Dr. Tan's lab which is locked at all times.

Voluntary Nature: Your participation is completely voluntary. You are free to withdraw from, or choose not to answer specific questions, at any time without explanation or penalty.

Data Dissemination: You can request for a summary of the results, which you will receive after the study has been completed. As well, the results of this study will be disseminated via conference presentations and in scientific publications. However, no identifying information will be associated with the data, which will be presented collectively, not individually.

Please provide your name and contact information below so that we can reach you if you qualify for further participation in this study or if you are a winner in the random prize draw:

Name: _____

Email: _____

Telephone: _____

If you wish to receive a summary copy of the results when the study has been completed, please provide us with your email address or mailing address below. We anticipate that the results will be available early 2020.

_____

_____

To start this study, please click the NEXT button below. This will take you to the screening questionnaire.

By clicking the "NEXT" button you are indicating that you have fully read and understood the information stated above, and that you voluntarily wish to participate in this study.

NEXT

This study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright at the Research Ethics Board by calling 807-343-8283 or emailing research@lakeheadu.ca

Appendix O

Part B: Debriefing Form A

MINDFULNESS, NIGHT EATING, AFFECT, AND SLEEP STUDY SCREENING QUESTIONNAIRE DEBRIEFING FORM

Thank you for completing the screening questionnaire for the *Mindfulness, Night Eating, Affect, and Sleep* study. You will be entered into a random prize draw for a $25.00 VISA gift card.

The screening questionnaire that you completed allows to ascertain whether or not you meet the criteria for participating in the main study. If you are selected for the main study you will be contacted by one of the researchers (Staci Person) via the contact information that you provided.

The main study looks at the link between mindfulness and night eating behaviours. The study involves completing several online self-report measures that ask about your mood, and eating and sleeping patterns, and attending free mindfulness sessions. Entries into random prize draws for $25.00, and $200.00 VISA gift cards and 2 bonus points in courses (where permitted by course instructors) are available to participants.

Please be assured that your name and contact information will remain confidential and will be removed from the screening questionnaire after completion of the study.

If you have any questions or concerns regarding this study, please contact Staci Person or Dr. Tan using the contact information provided below. You may also contact Lakehead University's Research Ethics Board, which has approved this study, at 807-343-8283.

Thank you for your time and participation. Your contribution to our research is very much appreciated.

Sincerely,

Staci Person, M.A.
Ph.D. Clinical Psychology Candidate
Department of Psychology
(smperson@lakeheadu.ca)

Josephine Tan, Ph.D., C. Psych.
Associate Professor/Project Supervisor
Department of Psychology
(jtan@lakeheadu.ca)

Appendix P

Part B: Cover Letter B

MINDFULNESS, NIGHT EATING, AFFECT, AND SLEEP
MAIN STUDY COVER LETTER

Dear Potential Participant,

We invite you to take part in our study. It is being conducted by Staci Person (smperson@lakeheadu.ca) who is a PhD Clinical Psychology student at Lakehead University, and by her dissertation supervisor, Dr. Josephine Tan (jtan@lakeheadu.ca).

The objective of this research project is to learn how several human functioning variables such as stress, coping, mood, quality of sleep, and mindfulness relate to night eating. You must be at least 18 years of age to participate and currently enrolled at Lakehead University (Thunder Bay campus only).

Participants in this study will be asked to do the following tasks:

a. Complete an online research questionnaire on two (2) separate occasions. The research questionnaire will contain items relating to mood, stress coping, eating and sleeping patterns and will take no more than 60 minutes of your time.
b. Attend a weekly 1.5-hour group session to learn mindfulness skills for four (4) weeks.
c. Practice the mindfulness skills every day for the rest of the week outside of the group sessions, and document the practice.

For each of the tasks, we offer ballots into different random prize draws for VISA gift cards and where permitted, bonus points towards certain course marks. This is our way of saying "thank you" for helping us out in this research investigation.

We keep all participant responses confidential and will store them in a secure place. Participants can choose not to answer any question or fulfill any task, and can drop out anytime they wish without explanation or penalty. There is no anticipated risk of harm or benefit to anyone for participating in the study. We will share a summary of the findings with any participant who wants to know how the study turns out.

This study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright from the Research Ethics Board at 807-343-8283 or research@lakeheadu.ca.
For more information about the study, please click on the NEXT button below to go to the informed consent form. It contains more details that you can read before you make an informed decision as whether or not you wish to be a participant in this study.

NEXT

Appendix Q

Part B: Consent Form B

MINDFULNESS, NIGHT EATING, AFFECT, AND SLEEP
MAIN STUDY CONSENT FORM

Title of Study: Mindfulness, Night Eating, Affect, and Sleep Study.

Researchers: Staci Person (Ph.D. Clinical Psychology Candidate, Lakehead University). Dr. Josephine Tan (Supervisor, Lakehead University).

Aim of Study: The aim of this study is to understand how several variables such as stress coping, mood, quality of sleep, and mindfulness relate to night eating.

Procedure: The procedure for the study involves the following:

a. Complete an online Research Questionnaire on two (2) separate occasions. The Research Questionnaire will contain items relating to your mood, stress coping, eating and sleeping patterns and will take no more than 60 minutes of your time. For each occasion that you complete the Research Questionnaire, receive 1 ballot into a random prize draw for a $50.00 VISA gift card (Prize Draw A). Psychology students who are permitted bonus points towards their course marks in exchange for research participation (e.g., Introductory Psychology courses) will also be given 1 bonus point for each Research Questionnaire completed for a maximum of 2 points. Participants who choose not to receive bonus points or who do not qualify for bonus points will be given an additional entry into Prize Draw A.
b. Attend a weekly 1.5-hour group session to learn mindfulness skills for four (4) weeks. Receive one ballot per mindfulness session attended for entry into a random prize draw for a $200.00 VISA gift card (Prize Draw B), for a maximum of 4 ballots.
c. Practice daily mindfulness skills every day for the rest of the week on your own, and document your daily practice. Receive one ballot per practice session completed and tracked for additional entry into Prize Draw B, for a maximum of 28 ballots.

Risks/Benefits: There is no obvious risk involved in participating in this study other than the fact that some individuals might feel uncomfortable answering some personal questions. Benefits include learning about research processes first-hand and knowledge that you are contributing to the advancement of research.

Confidentiality: All data collected will be kept strictly confidential. However, your name and contact information is requested so that we can link your responses from the two questionnaires and diaries. Data will be coded with a

number so that contact information can be destroyed after completion of the study to render all responses anonymous. The online survey tool used in the study, SurveyMonkey, is hosted by a server located in the United States. The US Patriot Act permits U.S. law enforcement officials, for the purpose of anti-terrorism investigation, to seek a court order that allows access to the personal records of any person without the person's knowledge. In view of this we cannot absolutely guarantee the full confidentiality and anonymity of your data. With your consent to participate in this study, you acknowledge this. All data stored on SurveyMonkey will be deleted as soon as the researchers have downloaded it. This information will only be accessed by the researchers, who have been trained in research ethics. The downloaded data will be securely stored in Dr. Tan's lab for 5 years, after which time it will be destroyed. The data will be encrypted during storage on a computer that is password protected and located in Dr. Tan's lab which is locked at all times.

Voluntary Nature: Your participation is completely voluntary. You are free to withdraw from, or choose not to answer specific questions, at any time without explanation or penalty.

Data Dissemination: You can request for a summary of the results, which you will receive after the study has been completed. As well, the results of this study will be disseminated via conference presentations and in scientific publications. However, no identifying information will be associated with the data, which will be presented collectively, not individually.

Please provide us with your name and contact information below so that we can reach you if you are a winner in one of the random prize draws:

Name: _____

Email: _____

Telephone: _____

If you are a student in an Introductory Psychology course or in another course at Lakehead University Thunder Bay campus where your instructor permits you to receive bonus points for research participation and you wish to receive 1 bonus point for your research participation, please provide us with the information below:

Student ID Number: _____

Professor's Name: _____

Course Number and Name: _____

If you wish to receive a summary copy of the results when the study has been completed, please provide us with your email address or mailing address below. We anticipate that the results will be available early 2020.

_____

_____

To start this study, please click the NEXT button below. This will take you to the research questionnaire.

By clicking the "NEXT" button you are indicating that you have fully read and understand the information stated above, and that you voluntarily wish to participate in this research study.

NEXT

This study has been approved by the Lakehead University Research Ethics Board. If you have any questions related to the ethics of the research and would like to speak to someone outside of the research team please contact Sue Wright at the Research Ethics Board by calling 807-343-8283 or emailing research@lakeheadu.ca

Appendix R

Part B: Debriefing Form B

MINDFULNESS, NIGHT EATING, AFFECT, AND SLEEP
MAIN STUDY DEBRIEFING FORM

Thank you for participating in this study. Before you leave, we would like to offer you additional information. We were not able to provide you with a lot of information about the study before starting because we did not want to influence your responses in light of what you think we expected to find.

In this study, we were examining how several variables such as stress, mood, and sleep relate to night eating behaviours before and after participation in a mindfulness-based intervention. Mindfulness is the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to things as they are.

Research shows that mindfulness effectively reduces stress, depression, anxiety, poor sleep quality, and rumination (a form of stress coping), all of which are linked to night eating. We are investigating whether or not mindfulness can help to alleviate night eating behaviours as well as associated psychological difficulties among students because researchers have not yet looked at this.

We anticipate the results to be ready by early 2020. If you had requested a summary of the results earlier, a copy will be sent to your email (or mailing address, if preferred). If you did not and would now like a copy, just email us – our contact information is at the bottom of this page.

We want to reassure you that your responses will be kept confidential. If you are an Introductory Psychology student at Lakehead University Thunder Bay campus or enrolled in other courses where the instructor permits bonus points, you will be given two bonus points towards your course mark. The amount of times that you are entered into the random prize draws will be determined by your attendance to the mindfulness sessions and adherence to the corresponding homework exercises. These draws will be held at the end of 2019. If you win, we will contact you to let you know so that you can claim your prize.

Please do not mention the purpose of this study to anyone. Many people have not yet participated in the study and we do not wish to influence their answers with the prior information as it would affect the validity of our findings. We hope that you will cooperate with us in this regard. We sincerely thank you.

Do you have any questions for us? Please contact us:

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Thank you for helping us with this project, it would not have been possible without your assistance. Below you will find a listing of community mental health resources that you can keep for your own information or relay to anyone who might be interested in the list.

Community Mental Health Resources

The city of Thunder Bay has therapy and counseling services that are available for individuals who require assistance coping with stress and regaining control of their lives. Issues may concern academic performance, personal relationships, mental health, occupational functioning, thoughts or intentions of harming one's self, etc. If you or anyone you know could use some assistance, please consider the following options:

- Student Health and Counseling Centre – *free* counseling for all Lakehead University students: located in Prettie Residence building, (807) 343-8361
- Mental Health Assessment Team – emergency services available from the Thunder Bay Regional Health Sciences Centre (TBRHSC)
- Family physicians or walk-in clinic physicians can be consulted for a referral for mental health resources (e.g., Mental Health Outpatient Programs at St. Joseph's Care Group or TBRHSC)
- Anishnawbe Mushkiki: counselling services for First Nations individuals, couples, and families: (807) 623-0383
- Thunder Bay Counseling Centre: counselling for individuals, couples, and families: (807) 684-1880 – fee for service
- Self-referral to any mental health professional in private practice (look up the Yellow Pages under *Psychologists and Psychological Associates; Psychotherapy; or Marriage, Family & individual Counsellors*) – fee for service
- Thunder Bay Crisis Response Service: (807) 346-8282
- Ontario Mental Health Helpline: 1-866-531-2600
- Ontario Drug and Alcohol Helpline: 1-800-565-8603
- Thunder Bay Canadian Mental Health Association: (807) 345-5564

Community Meditation Resources

If you are specifically interested in learning more about meditation resources available within the community of Thunder Bay please refer to the following:

- Mindfulness Thunder Bay: various mindfulness programs offered in a group format: (807) 623-3929 – by donation
- Lakehead University, located in Prettie Residence building (students only): mindfulness mediation groups offered on Mondays and Fridays 3:45pm – 4:15pm, and Tuesdays and Thursdays 11:45pm – 12:15pm – free ☺
- Lakehead Unitarian Fellowship: mindfulness mediation group offered on Wednesdays 7:30pm – 8:30pm (dawn@mindfultherapy.com)
- Brodie Library: Mondays 7:00pm – 8:30 pm
- Waverly Library: 4th Monday of each month 7:00pm – 8:00pm
- Body Mind Centre: Fridays 7:00pm – 8:15pm, Sundays 9:00am – 10:15am

Appendix S

Part B: Protocol for Mindfulness Sessions

SESSION 1: Stepping out of Automatic Pilot

- Raisin Exercise and discussion/reflection
- Body Scan and discussion/reflection
- Thoughts and Feelings exercise
- Home practice:
    - Body Scan once a day (audio track 3)
    - Eat one meal mindfully everyday
    - Practice mindfulness during a routine activity (e.g., brushing your teeth)

SESSION 2: Awareness of the Breath, Body, Sounds, and Thoughts

- Mindfulness of the Breath and discussion/reflection
- Homework review
- Mindfulness of Sounds and Thoughts plus discussion/reflection
- 3-Minute Breathing Space and discussion/reflection
- Home practice
    - Mindfulness of the Breath once a day (audio track 4)
    - 3-Minute Breathing Space three times a day (audio track 8)
    - Complete Pleasant and Unpleasant Experiences Calendar

SESSION 3: Mindful Movement

- Mindful Stretching and discussion/reflection
- Homework review
- Mindful Walking and discussion/reflection
- Office exercise
- 3-Minute Responsive Breathing Space and discussion/reflection
- Home practice
    - Stretch and Breath Meditation on days 1, 3, 5 (audio track 6)
    - Mindful Movement Meditation on days 2, 4, 6 (audio track 5)
    - 3-Minute Responsive Breathing Space whenever unpleasant feelings arise (audio track 9)

SESSION 4: Working with Difficulty

- Mindfulness of the Breath and discussion/reflection
- Homework review
- Working with Difficulty Meditation and discussion/reflection
- Reading of "The Guest House"
- Home practice
    - Working with Difficulty Meditation on days 1, 3, 5 (audio track 12)
    - Sitting with Silence Meditation 2, 4, 6 (audio track 13)
    - 3-Minute Breathing Space three times a day (audio track 8)
    - 3-Minute Responsive Breathing Space whenever unpleasant feelings arise (audio track 9)