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Research report

Education, progressive muscle relaxation therapy, and exercise for the treatment of night eating syndrome. A pilot study ☆

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ABSTRACT

Night eating syndrome (NES) is a circadian rhythm disorder in which food intake is shifted toward the end of the day, interfering with sleep. According to the biobehavioral model of NES, the disorder is the result of a genetic predisposition that, coupled with stress, leads to enhanced reuptake of serotonin, thereby dysregulating circadian rhythms and decreasing satiety. Using the biobehavioral model as a guide, we developed a brief behavioral intervention using education, relaxation strategies, and exercise to address the core symptoms of NES. In this pilot randomized controlled clinical trial, 44 participants with NES were randomly assigned to an educational group (E; $n = 14$), E plus progressive muscle relaxation therapy (PMR; $n = 15$); or PMR plus exercise (PMR Plus, $n = 15$). Participants received a baseline intervention with 1- and 3-week follow-up sessions. Effectiveness analyses showed that participants in all three groups evidenced significant reductions on measures of NES symptoms ($p < .001$), depression ($p < .05$), anxiety ($p < .01$), and perceived stress ($p < .05$). However, the only significant between group change was for the percent of food eaten after the evening meal, with the PMR group showing the greatest reduction (–30.54%), followed by the PMR Plus group (–20.42%) and the E group (–9.5%); only the difference between the PMR and E groups was statistically significant ($p = .012$). Reductions in NES scores were significantly associated with reductions on measures of depression ($r = .47$; $p < .01$) and perceived stress ($r = .37$; $p < .05$), but not anxiety ($r = .26$, $p =$ ns). Results support the role of education and relaxation in the behavioral treatment of NES.

Introduction

Night eating syndrome, or NES, is a combination eating and sleep disorder that has gained increasing attention in recent years, culminating in its inclusion in the Fifth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-V; American Psychiatric Association, 2013). In NES, the circadian rhythm of eating is shifted toward later in the day such that daily caloric intake is minimized with increased food intake toward evening and nighttime.

According to the consensus diagnostic criteria (Allison, Lundgren, O'Reardon et al., 2010), NES is characterized by consuming 25% or more of one's daily caloric intake after the evening meal and/or two or more nocturnal ingestions per week, defined as eating during nighttime awakenings (criterion I). Nocturnal ingestions are accompanied by conscious awareness (criterion II), thereby differentiating NES from sleep related eating disorder (SRED; American Academy of Sleep Medicine, 2005), a form of sleep walking. NES is further characterized by at least three of the following features, including lack of morning appetite and/or omission of breakfast at least 4 days per week; a strong urge to eat after the evening meal and/or during the night; the presence of sleep onset and/or sleep maintenance insomnia four or more nights per week; the belief that one must eat to initiate or return to sleep; and depressed mood or worsening of mood during the evening hours (criterion III). The disorder is characterized by significant distress and/or impairment in functioning (criterion IV), should be of at least three months duration (criterion V), and is not secondary to other substance use, medical disorders, medications, or other psychological disorders (criterion VI).

With regard to its clinical characteristics, NES affects 0.4 to 5.7% of individuals in the general population (Colles, Dixon, & O'Brien, 2007; Rand, Macgregor, & Stunkard, 1997; Rand & Kuldau, 1986; Striegel-Moore et al., 2005) and is associated with both physical and mental health comorbidities. NES is associated with eating disorders, overweight and obesity, sleep disorders, depression, and anxiety (Vander Wal, 2012). NES has repeatedly been documented to occur or be exacerbated during times of life event stress (Allison, Stunkard, & Thier, 2004; Caredda, Roscioli, Mistretta, & Pacitti, 2009; Spaggiari

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et al., 1994; Vander Wal, 2012). Corroborating evidence for the role of life event stress comes from evidence supporting the role of the glucocorticoid system in NES (Stunkard, Allison, Lundgren, & O'Reardon, 2009).

According to the biobehavioral model (Stunkard et al., 2009), NES is the result of a genetic predisposition that, coupled with stress, leads to enhanced reuptake of serotonin (i.e., enhanced serotonin transporter binding). The resulting decrease in the availability of postsynaptic serotonin leads to dysregulation of circadian rhythms and a decrease in satiety. Pharmacologically, use of selective serotonin reuptake inhibitors (SSRIs) should increase the availability of postsynaptic serotonin, thereby alleviating symptoms. From a behavioral perspective, interventions that decrease stress, increase serotonin, address circadian rhythm dysregulation, and improve satiety should be of treatment utility.

Comprehensive reviews of the pharmacological treatment of NES (Allison & Tarves, 2011; Milano, De Rosa, Milano, & Capasso, 2012; O'Reardon, Peshek, & Allison, 2005; Vander Wal, 2014) support the use of SSRIs such as sertraline and escitalopram, findings consistent with the biobehavioral model. In addition, available evidence also supports the use of dopaminergics such as pramipexole and anticonvulsants such as topiramate. Although the pharmacological treatment of NES shows promise, there are drawbacks. To date, only two of the pharmacological studies are classified as randomized controlled clinical trials (O'Reardon et al., 2006; Vander Wal, Gang, Griffing, & Gadde, 2012), both of which have been of relatively short duration, raising concerns about the cost, stability of treatment response, and placebo effects (Vander Wal, 2012, 2014). Further, the symptoms of NES may not remit or remit fully, and SSRIs may be accompanied by side effects, particularly sexual dysfunction, weight gain, and sleep disturbance (Ferguson, 2001). Some individuals cannot or would prefer not to take medication. Finally, the long-term outcomes of medications have not yet been studied. Alternatively, behavioral interventions may be used to address stress, increase satiety, increase serotonin, and regulate circadian rhythm disruptions. While requiring time and investment, they offer the advantages of teaching a skill set that can be maintained (Berner & Allison, 2013) and can be used to augment the effects of medication, wean patients from medication, or as a stand-alone treatment.

Aside from case studies, only two studies have been conducted on the behavioral treatment of NES (for reviews, see Allison et al., 2004; Allison & Tarves, 2011; Berner & Allison, 2013; Vander Wal, 2012, 2014). A randomized controlled clinical trial (Pawlow, O'Neil, & Malcolm, 2003) tested the short-term efficacy of abbreviated progressive muscle relaxation therapy (PMR). PMR reliably reduces stress (Carlson & Hoyle, 1993), which is associated with decreases in corticotropin releasing factor and cortisol levels as well as increases in nocturnal levels of melatonin, which may improve sleep (Hazlerigg, 2001). The 10 patients in the intervention group were instructed in PMR and asked to perform it nightly before bed; the 10 patients in the control group received the intervention one week later. On the day of instruction, PMR produced significant reductions in salivary cortisol levels in the intervention group. At one week, the intervention group showed significant improvements on measures of state anxiety, perceived stress, depression, and hunger levels in comparison to the control group. These improvements were then replicated within the control group with the exception that the reduction in cortisol levels did not achieve statistical significance. This study, although of very brief duration, suggests that stress management can be reliably implemented and used to decrease stress, one of the mechanisms in the biobehavioral model of NES.

The only other treatment outcome study was an uncontrolled trial in which 25 patients with NES were treated with 10 sessions of cognitive behavioral therapy (CBT) delivered over the course of 12 weeks (Allison, Lundgren, Moore, O'Reardon, & Stunkard, 2010). The 14 patients who attended at least 8 of the 10 sessions showed significant improvements in post-dinner caloric intake, number of nocturnal ingestions, number of nighttime awakenings, depressed mood, and quality of life. The intervention included the following components: psychoeducation regarding NES, education in sleep hygiene and healthy eating, modifications in eating schedule and location, self-monitoring of eating, exposure and prevention for craved foods, relaxation strategies, cognitive restructuring, exercise, elicitation of social support, and medication referrals (Allison, 2012). While this study suggests the potential efficacy of CBT, it also had a high dropout rate, likely due to a high participant burden and intensity of treatment. A shorter treatment, capable of reaching more people, would be ideal.

Using the biobehavioral model as a guide, we developed an abbreviated behavioral treatment protocol to address the core components of the biobehavioral model, including stress management, increasing serotonin, regulating circadian rhythms, and improving satiety. Stress can be alleviated via the provision of education about NES and implementation of relaxation strategies. Depression can be decreased and sense of well-being increased through exercise, possibly via an increase in serotonin among other mechanisms (Fox, 1999; Wipfli, Landers, Nagoshi, & Ringenbach, 2011). Meta-analytic reviews of both acute and chronic exercise suggest that even among good sleepers, moderate exercise produces beneficial effects on sleep, including decreases in REM latency, increases in slow wave sleep, and increases in total sleep duration with larger effects for persons with impaired sleep (Kubitz et al., 1996; Youngstedt et al., 1997). Further, exercise accelerates re-attainment of the sleep–wake cycle following disruption (Yamanaka et al., 2006). Finally, satiety can be improved via education about nutrition as well as the use of structured meals and snacks (Cooper, Fairburn, & Hawker, 2003).

Therefore, the primary purpose of the present study was to test a novel, brief intervention for NES and to evaluate the feasibility of recruitment, randomization, retention, and intervention implementation (Leon, Davis, & Kraemer, 2011). The second purpose was to examine the effectiveness of PMR (PMR) and PMR plus moderate exercise (PMR Plus) in contrast to education (E) for the treatment of NES. It was hypothesized that PMR Plus would produce the greatest beneficial effects, followed by PMR. Primary outcomes were defined as changes in NES diagnosis and the Night Eating Questionnaire (NEQ; Allison et al., 2008) scores. Secondary outcomes included changes in measures of depression, anxiety, perceived stress, and individual NES symptoms.

Method

Participants and recruitment

Participants were 44 men and women (31 female, 13 male; 26 White, 15 Black, 3 Other) with a mean age of 46.07 years (SD = 12.67) and a mean body mass index (BMI) of 31.31 (SD = 5.90).

The study was approved by the university Institutional Review Board (IRB). Advertisements were placed in flyers, email list serves, circulars, radio, and mentioned in two brief television interviews. All advertisements extended an invitation to participate in a research study on the behavioral treatment of NES and presented the core symptoms of waking up at night to eat or eating too much after dinner but before going to bed, trouble falling or staying asleep, and lack of morning appetite.

Participants underwent a two-stage screening process. In the first stage, participants called the study number to receive a brief study overview and to schedule a telephone screening session. During the telephone screening session, participants provided verbal informed consent and completed initial eligibility screening based on the NES diagnostic criteria and study eligibility criteria. Study inclusion criteria comprised the following: 1) age 18–65; 2) BMI 20–45 kg/m^2;