The Contributions of Child and Romantic Attachment to Sleep Quality

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by

Karen Estefane

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This manuscript has been read and accepted for the Graduate Faculty in Psychology to satisfy the dissertation requirement for the degree of Doctor of Philosophy.

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ABSTRACT

The contributions of child and romantic attachment to sleep quality

by

Karen Estefane

Advisor: Margaret Rosario, Ph.D.

Little is known about the relation between attachment and sleep, although both develop around the first year of life and mutually influence each other. Furthermore, attachment styles and dimensions have been associated with sleep difficulties in both childhood and adulthood. However, these findings have not been consistent, especially among dismissing individuals. In addition, the specific contributions of both child and romantic attachment to sleep quality have not been investigated thus far. This cross-sectional study aims to examine the ways child and romantic attachment are associated with sleep quality. A sample of 671 heterosexual residents of the United States, aged 18 to 65 years, were recruited through social media platforms. It was hypothesized that: 1) Romantic attachment significantly and positively explains the association between child attachment scores (higher scores indicate less security) and poorer sleep quality so that this association is weakened in the presence of romantic attachment; 2) Dismissing or secure romantic attachment is related to good sleep quality while preoccupied or fearful romantic attachment is related to poor sleep quality. Analyses were stratified by sex and were adjusted for age, race/ethnicity, education, income, marital status, length of current romantic relationship, and recruitment site. The mediational hypothesis (1) was supported for models examining the relation between child anxious attachment and sleep quality in men and women. The test of the second hypothesis revealed a significant relation between romantic attachment dimensions and
sleep, but no specific attachment style was associated with sleep quality. The links between romantic attachment insecurity and sleep dysfunction by sex suggests that men and women regulate affect differently. Considering attachment as part of the broader framework of emotion regulation provides a window into individual differences in sleep quality, and sleep-wake patterns may be understood as manifestations of attachment behaviors in research, prevention, and treatment of sleep difficulties in adults.
Acknowledgments

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INTRODUCTION

The current study aimed to examine the relations of child and adult romantic attachment with sleep quality in adults. Little is known about the association between attachment and sleep, despite the importance of sleep for well-being in multiple domains of life. Identifying how child and adult romantic attachment connect with sleep quality in adulthood provides a focus for the prevention and treatment of sleep dysfunction. Sleep difficulties are prevalent in the general population and are considered a public health epidemic (Bixler, Kales, & Soldatos, 1979; Institute of Medicine, 2006).

The present chapter aims to situate the study in the current literature by introducing the concepts of sleep quality, child attachment, and romantic attachment. It is composed of a review of the theory and research of each of the concepts as well as of the relations among them. The chapter concludes with the proposed study’s hypotheses.

Sleep

The era of modern sleep research began in 1953, when periods of Rapid Eye Movements (REM) during sleep were discovered (Aserinsky & Kleitman, 1953). In the 1970s and 1980s, the ability to study sleep and wakefulness objectively with polysomnography provided biological psychiatry with one of its first and most accessible tools. Early investigations were concerned with basic sleep research, but during the last thirty years sleep researchers have focused more specifically on the evaluation and treatment of sleep disorders (Abad & Guilleminault, 2003; Sateia, 2014; Soldatos, Kales, & Kales, 1979). The field of sleep medicine has blossomed to the point that it is truly interdisciplinary, comprising specialists from the areas of pulmonary medicine, neurology, psychiatry, internal and family medicine, pediatrics, psychology, and others. Yet the discipline of sleep medicine is in its infancy (Kryger, Roth, and Dement, 2017).
Sleep is a natural periodic state of rest characterized by a typical body position, closed eyes, diminished responsiveness to external stimuli and interaction with the environment, as well as a reversible condition of altered and decreased awareness. Sleep is a fundamental biological need in humans and occupies a third of human life. The restorative function of sleep is essential not only for optimal physical and mental function but also for survival.

However, sleep is not a passive state that ensues in the absence of wakefulness: it is an active process wherein some brain regions show the same or increased activity as during wakefulness. Neurons originating in the brain stem raphe nuclei form part of the activating system that promotes arousal and wakefulness (Adrien, 2002) (see Table 1 for definitions of sleep terms). In general, the waking state is mediated by a system of neurons called the ascending reticular activating system and by the excitatory activities of various neurotransmitters. Such neurotransmitters, including norepinephrine, serotonin, dopamine, acetylcholine, histamine, and glutamate are therefore involved in the regulation of sleep and various sleep stages.

<table>
<thead>
<tr>
<th>Table 1. Definition of Sleep-related Terms.</th>
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<tbody>
<tr>
<td><strong>Brain stem</strong></td>
</tr>
<tr>
<td><strong>Sleep architecture</strong></td>
</tr>
<tr>
<td><strong>Sleep duration</strong></td>
</tr>
<tr>
<td><strong>Sleep efficiency</strong></td>
</tr>
<tr>
<td><strong>Sleep onset latency</strong></td>
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### Sleep-related mentation

The cognition (typically dreams) that is associated with the sleep state that the person was in before being awoken.

<table>
<thead>
<tr>
<th>Rapid eye movement (REM) sleep</th>
<th>A period of sleep characterized by very high brain activation levels in the limbic system, rapid movement of the eyes under closed eyelids, muscle paralysis, and sexual activation (penile erection in men and clitoral engorgement and pelvic thrusting in women). REM occurs approximately every 90 minutes and increases in duration as the night progresses.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-rapid eye movement (NREM) sleep</td>
<td>This sleep state constitutes the majority of sleep. It is made up of Stage 2/light sleep and Stage 3 and 4/deep sleep characterized by slow wave forms on the electroencephalogram (EEG) [test that measures and records brain electrical activity, and most common tool used in sleep research].</td>
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**Physiology of sleep**

Normal sleep and wake states are regulated by two separate biological mechanisms which interact together: sleep-wake homeostasis and the circadian rhythm. Sleep-wake homeostasis involves an internal timer that generates pressure for sleep and regulates sleep intensity by the accumulation of sleep-inducing substances in the brain (e.g. adenosine). It effectively reminds the body that it needs to sleep after a certain time, and it works quite intuitively: the longer we have been awake, the stronger the desire and need to sleep, and the greater the likelihood of falling asleep; the longer we have been asleep, the greater the pressure for sleep to dissipate, and the greater the likelihood of awakening. Circadian rhythms are our daily biological clocks. They affect timing for sleep and are coordinated with the day-night/light-dark cycle. Circadian rhythms involve changes in body temperature, hormonal secretions, and other bodily functions every 24 hours, all of which affect readiness for and maintenance of sleep. Circadian rhythms are controlled by the suprachiasmatic nuclei of the anterior hypothalamus. It is important to note that sleep-wake homeostasis and circadian rhythms promote a decrease in alertness and regulate sleep through the basal forebrain and regions of the forebrain.
Because sleep represents a period of turning off awareness and responsiveness, it is adaptive for sleep to be restricted to times and places relatively safe from predators or other dangers. The opponent processes of sleep and arousal are largely influenced by a relative sense of safety versus threat, and any perception of threat in the environment will increase arousal and inhibit sleep. Aspects of the system that increase arousal dominate in short time frames permitting the individual to accommodate acute threats, affective responses, and demands for attention. Over longer intervals, however, the sleep and circadian systems must predominate to achieve a balance regarding alternative physiologic requirements (Dahl, 1996).

During sleep, the cortical activity of the brain undergoes regular, cyclic changes. There are several specific aspects of sleep including the continuity, timing, and patterning of different stages of sleep that are necessary for the restorative process to occur.

The basic structural organization of sleep is called sleep architecture; it is most accurately defined by electroencephalography (EEG) recordings which allow the classification into different sleep stages according to various types of brain waves. Sleep is classified into two main states, REM sleep and NonRapid Eye Movement (NREM). During NREM sleep, or “quiet” sleep, a person progresses through four stages of increasingly deep sleep.

Beta waves, with high frequency and low amplitude, are the pattern of waves that are present when one is awake and alert. Alpha EEG activity, a sinusoidal rhythm with a frequency of 8–12 Hz, is the predominant EEG frequency recorded during passive wakefulness. During the onset to sleep, Alpha EEG activity typically diminishes and is replaced by a low voltage activity of mixed frequency, mainly Theta (4-7 Hz), and, as sleep deepens, Delta (0.5-3 Hz) (Sloan, Maunder, Hunter, & Moldofsky, 2007). Stage 1 of sleep is a light sleep from which one can easily be awakened. During this stage, brain wave patterns become more irregular and the
presence of slower theta waves increases. Stage 2 is a deeper level of sleep characterized by sleep spindles, which are periodic bursts of rapid brain wave activity. In stage 3, there is the regular appearance of slow and large delta waves. Stage 4 represents the deepest level of sleep during which delta waves dominate the EEG pattern. Because of the presence of delta waves, stages 3 and 4 are referred to as slow-wave sleep, and NREM sleep encompasses stages 1 to 4 (Passer & Smith, 2010). Rapid Eye Movement (REM) sleep, characterized by frequent movements of the eyes, emerges after stage 4. Body temperature, blood pressure, heart rate, and breathing increase to levels measured when people are awake. Activity of the motor neurons at the level of the brain stem and spinal cord is inhibited, so that the muscles are immobilized, which is termed REM sleep paralysis. REM sleep is also called paradoxical sleep and active sleep because it has aspects of deep sleep and light sleep at the same time: the body is highly aroused, yet there is very little movement. The brain is also very aroused, to levels almost identical to awakening. Sleep mentation, or the imagery and thinking experienced during sleep, is vividly expressed in dreams, usually in the REM stage. It is usually experienced less distinctly in NREM sleep, but it may be quite vivid in stage 2 of sleep, especially toward the end of the sleep episode or sleep interval. Empirical studies show that REM is responsible for consolidation of emotional memories (Nishida, Pearsall, Buckner, & Walker, 2008).

Throughout the night, approximately every 90 minutes, a normal sleeper cycles between REM and NREM sleep, although the length of time spent in one or the other changes as sleep progresses. REM time periods increase in length, while stages 3 and 4’s duration decreases, making sleep shallower (Passer & Smith, 2010). Figure 1 illustrates the stages of sleep with accompanying brain waves over time.
Sleep duration and patterns

Over a typical lifespan, both duration and patterns of sleep change. Newborns spend from 16 to 20 hours asleep each day, and by 6 months of age, the longest continuous sleep period has lengthened to 6 hours (Anders, 1994). Between the ages of one and four, total daily sleep time decreases to about 11 or 12 hours. This gradual decline continues through childhood, such that an adolescent will need—though not necessarily get—about nine hours of sleep to function at his or her best. Adults through middle age need at least eight hours, and although the elderly may still require up to eight hours, they may struggle to obtain those hours in one block. Over time, in adulthood, the amount of time spent sleeping declines (Passer & Smith, 2010).

In addition to changes in sleep duration, sleep patterns also change as we age. In the beginning, a newborn's sleep is sporadic: the need to sleep and the need to eat cycle across the day and night, with little time for anything else (Davis, Parker, and Montgomery, 2004). Within the first month following birth, sleep-wake state organization begins to adapt to the light-dark
cycle and to regularly recurring associated social cues (Anders, 1979). After three or four months, maturation, including the emergence of the circadian rhythm, leads infants to progressively develop a pattern in which sleep becomes consolidated into longer periods (Anders, 1979).

Older infants and young children typically obtain their sleep during a solid nighttime session plus two or more daytime naps. Generally speaking, through the toddler years, naps become fewer in number and shorter in duration, and sleep becomes more consolidated during the night. By the age of six or seven, many children have stopped taking naps entirely. Their sleep is experienced much as it will be through adulthood: in a single consolidated block, most often at night (Passer & Smith, 2010). Furthermore, infants’ and children’s cycles contain a relatively large amount of slow-wave sleep. Overall, children spend more time in sleep than in wakefulness during the entire first decade of their life (Galland, Taylor, Elder, & Herbison, 2012).

In adulthood, sleep changes dramatically between the mid-20s and mid-50s, with individuals going to bed and waking up earlier; also, the amount of slow-wave sleep slowly declines. Elderly adults typically have relatively short periods of slow-wave sleep and fewer of them. In other words, sleep is lighter and more fragmented with brief arousals or longer awakenings throughout the night (Passer & Smith, 2010).

**Sleep quality**

“Sleep quality” is an important clinical construct since complaints about sleep quality are extremely common in the general population. However, it represents a complex phenomenon that is difficult to define and measure objectively. “Sleep quality” includes quantitative aspects of sleep, such as sleep duration, sleep (onset) latency, sleep efficiency or number of arousals, as
well as subjective elements such as “depth” or “restfulness”. Sleep quality laboratory measures may correlate with perceived sleep, but they cannot define it entirely. In addition, the relative elements that compose sleep quality may vary from one individual to the other (Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989). Evidently, good sleep quality is associated with a wide range of positive outcomes such as better health, less daytime sleepiness, and greater well-being.

**Sleep disturbances and disorders**

Sleep difficulties are common in the general population and increasingly recognized as a public health epidemic, with 50 to 70 million American adults chronically suffering from a sleep disorder (Institute of Medicine, 2006) and approximately 25% of all children and adolescents experiencing some type of sleep disturbance (Salzarulo & Chevalier, 1983).

Sleep deprivation from medical and psychiatric conditions, as well as lifestyle (e.g. shift work, jet lag) is epidemic in modern society, affecting millions of persons daily (Report of the National Commission on Sleep Disorders Research, 1993). It is well-established that sleep deprivation is a risk to human health and safety through its effects on brain function, which include increased lapses of attention, deficits in cognition and memory, and involuntary sleep onset (Dinges, 1992). Each year, sleep disorders, sleep deprivation, and sleepiness add an estimated $15.9 billion to the national health care bill (The National Center on Sleep Disorders Research, n.d.). The most common sleep disorders in adulthood include insomnia, sleep apnea, restless legs syndrome, and narcolepsy (National Institute of Neurological Disorders and Stroke, 2017). Other sleep disturbances include sleep quality impacted by pain and hypersomnia, characterized by excessive daytime sleepiness and excessive periods of sleep every day (usually sleeping more than 10 hours a day). Twenty-five percent of U.S. adults have pain that disrupts
their sleep for at least 10 nights per month (Lamberg, 1999) and 4.2 % of the general adult population complain of hypersonnia (Bixler, Kales, Soldatos, Kales, & Healey, 1979). There are no widely accepted criteria for judging which abnormalities of sleep justify medical intervention, nor is there consensus over the types of interventions that might be indicated (Kripke, Simons, Garfinkel, & Hammond, 1979).

**Insomnia in adulthood**

Life is filled with events that may cause occasional insomnia in an individual who usually sleeps well. However, for many people, this condition occurs repetitively (nightly, weekly) over a prolonged period that may last from some months to several years. Insomnia is a perception of inadequate, insufficient, or non-restorative sleep; thus, insomnia represents not only the inability to fall asleep, but also the inability to stay asleep and to experience a restful sleep. It is the most common sleep disorder reported in the United States and among all sleep-related complaints, insomnia is the most prevalent. While 27 % to 35 % of adults complain of difficulty falling and/or staying asleep, 10-15 % report chronic or severe insomnia (Karacan et al., 1976; Klink & Quan, 1987; Vgontzas, Liao, Bixler, Chrousos, & Vela-Bueno, 2009). Also, about 4 % of the adult population uses sleeping pills on a regular basis to induce or maintain sleep by suppressing activities in the central nervous system (Chong, Fryar, & Gu, 2013). The variation in prevalence rates of insomnia depends on the study design, population examined, and ascertainment methods. As a transient phenomenon, insomnia is commonplace and frequently remits spontaneously. In its chronic form, insomnia is associated with several negative health outcomes and a severely reduced quality of life (Kyle, Morgan, & Espie, 2010).

Stressful negative life events are the most common precipitating factors of insomnia (Bastien, Vallières, & Morin, 2004); in a retrospective study, 74 % of poor sleepers recalled
specific stressful life experiences associated with the onset of insomnia (Healey et al., 1981). Indeed, stress prevents recuperation through sleep by producing significant physiological activation, which is in conflict with the inherent physiological deactivation during sleep.

**Sleep disturbances in infancy and childhood**

With respect to infancy and childhood, sleeping problems such as bedtime struggles and night waking are the most common difficulty for which parents seek help during infancy (Morrell & Steele, 2003). Nightmares, night terrors, sleepwalking, and sleeptalking are clinically less common, and sleep apnea is a relative newcomer in the field (Anders & Weinstein, 1972).

Large-scale epidemiological surveys have reported that between a quarter and a third of children between the ages of 6 months and 5 years have difficulties going to bed, falling asleep, or sleeping through the night (Armstrong, Quinn, & Dadds, 1994; Pollock, 1994). Settling, another sleep dysfunction, has been defined as sleeping without removal from the crib from midnight to 5 am for at least four weeks (Moore & Ucko, 1957). In one survey, 12.5% of 3-year-old children had settling problems (Richman, Stevenson, & Graham, 1975).

Night-waking has been defined as an arousal during that time at least once weekly for four weeks. Measures obtained by actigraphy, video, and polysomnography reveal that infants wake up on average 3 times during the night from birth to 1 year of age (Touchette, Petit, Tremblay, & Montplaisir, 2009). During the first few months of life 95% of infants signal or cry after a nighttime awakening and will not return to sleep without a parental interaction. By age 15 months, however, video recordings of children at home show that approximately 70% of infants are able to self-soothe and return to sleep without disturbing their parents (Anders, 1979).

Research shows that this leaves about 20 to 30% of 1- to 2-year-old children with persistent waking difficulties (Richman, 1981) decreasing to about 14% at 3 years (Richman,
A variety of factors influence night wakings in infancy and early childhood but children’s ability to return to sleep unaided plays a major role in determining whether or not wakings will persist and become problematic (Touchette et al., 2005).

Anders (1979) noted that mothers demonstrate a wide variety of responses to their sleeping infants, and that these responses change as the infants grow older. For instance, more total maternal interventions were offered to the younger infants, although there were no more removals from the crib.

An attachment object, such as a toy or a blanket, may facilitate separation for some children. Three-year-old children who used an attachment object were found to have fewer difficulties in going to bed, and also to be more independent. There was a tendency for disturbed children to use such objects less, but most children without such an object also achieved satisfactory independence and settling (Boniface & Graham, 1979).

Overall, sleep difficulties in young children are often part of a generalized behavioral disturbance and, not unexpectedly, they are also associated with strained family relationships (Richman, 1981).

**Sleep impairment in late adulthood**

Insomnia and disrupted sleep in elderly people are common and recognized by clinicians as representing changes associated with normal aging as well as effects of clinically significant primary or secondary sleep disorders (Ganguli, Reynolds, & Gilby, 1996). Because older adults are less able than younger adults to maintain sleep, the elderly suffer disproportionately from chronic sleep deprivation (Haimuv, Hanuka, & Horowitz, 2008). Primary sleep disorders include insomnia and sleep apnea. The few prospective community-based surveys that have been conducted in elderly populations suggest that insomnia can be a tenacious problem. In studies
with 2- to 4-year follow-up periods, the persistence rate of insomnia is between 47% and 84% (Ganguli, Reynolds, & Gilby, 1996). Respiratory disorders, such as sleep apnea, which cause multiple arousals during the night, also become more common as people age (Bixler et al., 2001; Bixler, Vgontzas, Ten Have, Tyson, & Kales, 1998). Other problems, such as restless legs syndrome, which results in an uncontrollable need to move one's legs while drifting off to sleep, or periodic limb movements, characterized by jerking of the feet or legs at night, can make it difficult to fall asleep or lead to highly fragmented sleep (Aurora et al., 2012).

As part of secondary sleep disorders, they are a common side effect caused by many chronic medical conditions such as arthritis, congestive heart failure, and gastroesophageal reflux disorder (Ancoli-Israel & Ayalon, 2006). Unfortunately, sleep problems in older adults often go undiagnosed and untreated simply because many people believe sleep problems are a normal part of aging or that nothing can be done to help them sleep better.

**The effects of sleep**

Sleep is an important self-regulatory mechanism that has profound effects on physical, social, emotional, and occupational functioning (Dew et al., 2003; Institute of Medicine, 2006). Good sleep is a recuperative process that is important for the proper functioning of the immune system and insufficient sleep can weaken the body and put one at risk for various diseases. A link has been found between poor sleep quality and immune, metabolic, neurological (e.g. cerebral degenerative disorders, dementia), and neuroendocrine dysfunction (Abad & Guilleminault, 2003; Dinges, Douglas, Hammarman, Zaugg, & Zapoor, 1995; Spiegel, Leproult, & Van Cauter, 1999). Cognitive impairments constitute another serious negative consequence of poor sleep (Fulda & Shultz, 2001). Moreover, individuals experiencing sleep insufficiency are more likely to have chronic diseases such as cardiovascular disease or diabetes. One frequently
measured component of sleep quality, sleep duration, may even have a direct association with mortality (Kripke, Simons, Garfinkel, & Hammond, 1979). Additionally, sleeping disturbances increase risk for further impairment: unintentionally falling asleep and having difficulty perform daily tasks because of sleepiness contribute to hazardous outcomes, like motor vehicle crashes, industrial disasters, medical and occupational errors, as well as lowered social functioning (Swanson et al., 2011).

Poor sleep quality has been associated with various measures of impaired well-being, such as loneliness (Cacioppo et al., 2002) and chronic pain (Smith, Perlis, Smith, Giles, & Carmody, 2000). Sleep disturbances, especially insomnia and daytime sleepiness, are a core feature across many emotional disorders, including sleep disorders, depression, and anxiety (Abad & Guilleminault, 2003; Harvey, 2010; Krystal, 2006). Indeed, psychological conflicts often underlie the development and persistence of disorders like insomnia (Soldatos, Kales, & Kales, 1979). The two major atypical sleep components observed in depressed patients are insomnia and increased REM sleep pressure: the latter term means that once sleep is initiated, the first REM period occurs after a short latency (Tsuno, Besset, & Ritchie, 2005).

Conversely, patients with sleep disorders often complain of mood and anxiety symptoms, and can even present with symptoms resembling psychosis, as in the case of sleep-related hallucinations and catapexy in narcolepsy (Buysse, 2010). Recent studies in children and adults suggest that sleep problems may be a risk for, and even directly contribute to the development of some psychiatric disorders (Brand et al., 2014; Brower, 2001; Cho et al., 2008). The emerging perspective includes the possibility that there may be complex, bidirectional relations between sleep and psychological problems, whereas, traditionally, clinicians and researchers viewed sleep difficulties as symptoms (American Psychiatric Association [APA],
1994; Armitage, Trivedi, Hoffmann, & Rush, 1997; Benca, 2005; Breslau, Roth, Rosenthal, & Andreski, 1996; Dow, Kelsoe, & Gillin, 1996). To clarify the causal direction, a few laboratory studies examined the effects of sleep deprivation on mood states. Findings showed that after 26 hours of sleep deprivation, healthy individuals showed increased depression scores (Scott, McNaughton, & Polman, 2006). Also, insufficient sleep as 4 hours a night for 12 consecutive days led to a progressive decline in “optimism-sociability”, a state defined by Haack and Mullington (2005) as high psychosocial functioning and a positive outlook. These are short-term effects, but suggest that sleep deprivation is an independent risk factor for the development of various psychological disturbances, although not for all (e.g. impulsive behaviors; Acheson, Richards, & de Wit, 2007).

As with other psychological dysfunctions, sleeping disturbances are more common among alcoholics than non-alcoholics (Aldrich, 1998; Ehlers, 2000). Also, alcohol’s impact on human sleep has received much scientific study dating back to early experiments by Kleitman (1939), described in his book Sleep and wakefulness. Both acute and chronic alcohol consumption alter the activity of many of the neurotransmitters involved in the regulation of sleep, such as serotonin and norepinephrine (Brower, 2001).

**Sex and sleep**

Epidemiological studies conducted in Western societies show poorer sleep quality and a higher proportion of psycho-physiological sleep disorders such as primary insomnia in women compared to men (Akerstedt, Fredlund, Gillberg, & Jansson, 2002; Djaza et al., 2005). In view of the prevalence of data collected from men, it is not yet clear which factors contribute most to sleep disturbances among women (Djaza et al., 2005). Sex steroids (e.g. estrogen) not only exert peripheral effects on female sex organs such as the gonads, but also have powerful actions on the
brain (Baulieu, 1998; Fink, Sumner, McQueen, Wilson, Rosie, 1998). Through manifold interactions with the most important neurotransmitter systems at critical brain nuclei (e.g. the basal forebrain and the raphe nuclei), estrogen can regulate a multitude of brain functions, including cognitive performance, mood, movement coordination, pain and sleep. Yet explaining disturbance in women’s sleep is more complex because there is, in addition to the genome and biological factors, the role of psychosocial factors. An exciting new dimension in sleep research is the “sociology of sleep”, as sociologists contend that sleep takes place in a social context, which affects the patterning of sleep throughout the life course (Williams, Meadows, & Arber, 2010). As a mirror of everyday life, sleep reflects the roles and responsibilities, gender divisions, health patterns and transitions that characterize people’s lives. Theoretical underpinnings as well as a research agenda have been established in many scientific works, but there has until now been a lack of empirical studies which focus specifically on an examination of the social context and women’s sleep, with the exception of Hislop and Arber’s (2003 a,b,c) research on sleep in women aged 40 and over. They suggest that sleep has become a disposable resource for women in mid-life, a low priority which competes unfavorably with the demands of motherhood, career, marriage, and caring for aging parents. Later life is characterized by a series of transitions and changes in identity and status as women move from work to retirement, from an active to more sedentary lifestyle, from caring for children and elderly parents to caring for their partner, and from the role of spouse to widow. As lifestyles in later life are restructured, so too are sleep patterns. The transition from work to retirement, for example, may be typified by shifts in sleep–wake patterns that were once structured by alarm clocks and work routines. Increased napping during the day, lack of exercise and boredom can have adverse effects on sleep at night (Hislop & Arber, 2003 a,b,c).
Cultural variations in sleep

Cultural differences in sleeping locations (on the ground, on communal platforms, in beds) and in sleeping partners (alone, with a spouse, with immediate family, in community groups, and so on) in different traditions and societies also have a bearing on the timing, duration and regularity of sleep. Co-sleeping, where a baby or young child sleeps in the same bed as its mother, was a very common practice up until the 19th Century, and it remains so today in traditional or developing countries. For example, in Japan, infant rearing practices are guided by the cultural value given to the concept of ‘Amae’. Within the cultural system of ‘Amae’ the goal of child rearing is to foster dependence rather than independence as in western culture (Watanabe, 1994). It is therefore not surprising that infant co-sleeping is the norm in Japan. In the West, even if cosleeping is not as prevalent as in the past, waking children are more often sleeping in their parents’ room than not (Richman, 1981). Research shows that in Western cultural contexts, cosleeping is associated with the development and maintenance of infant sleeping problems. In contrast, in non-Western cultures, where cosleeping in young children is accepted as normative, the reverse association is found (Morrell & Cortina-Borja, 2002).

Comparisons of sleep patterns in different countries were conducted, and although there is cultural heterogeneity within countries, differences between countries may reflect some shared cultural values or practices within each country as a whole. For instance, one study collected self-reported sleep habits among over 40,000 children aged 11 to 16 years from eleven mostly European countries, including Austria, Belgium, Finland, Hungary, Israel, Norway, Scotland, Spain, Sweden, Switzerland and Wales, and bedtimes varied only by one hour between the countries (Tynjälä, Kanas, & Välimaa, 1993).
Another sleep-related behavior that is likely to vary between cultures is napping. In the study of 10 countries around the world, the proportion of adults reporting regular napping varied greatly from 12% in Japan to 42% in Brazil (Soldatos, Allaert, Ohta, & Dikeos, 2005).

Most studies that examined racial or ethnic differences in sleep in the United States have compared African Americans to whites, and differences in sleep durations, daytime sleepiness, and overall sleep quality were found, with the former group having worse sleep than the latter. Many of these differences, however, were confounded by socioeconomic status (Knutson, 2013).

Attachment

Child Attachment

Attachment theory

Bowlby (1958) was interested in explaining what, in his first major statement of attachment theory, is the attachment bond, what he called “the child’s tie to his mother”. Attachment was described by Bowlby as a unique affectional bond between infant and caregiver and an interactional biobehavioral system, consisting of several physiological and behavioral systems, that allows a child to maintain protective proximity to an adult he or she is attached to through the developmental period in which the child cannot care for him- or herself and provide a sense of safety and security (Bowlby, 1969, 1973, 1977, 1980). Bowlby, along with his colleague James Robertson, observed that children experienced intense distress when separated from their mothers, even if they were fed and cared for by others. A predictable pattern emerged - one of angry protest followed by despair (Robertson & Bowlby, 1952). In an attempt to determine why this set of behavioral responses evolved, Bowlby (1969) proposed that both the "protest" and "despair" phases are strategies selected during evolution because of their adaptive value. Indeed, his evolutionary theory suggests that children come into the world biologically
pre-programmed to form attachments with others to survive and that a set of behavioral responses or strategies evolved. The child’s initial behaviors toward the person they are attached to, whom Bowlby called “attachment figures”, are neither learned nor do they need to be reinforced by any drive reducing characteristics of the caregiver. According to Bowlby (1958), “The instinctual responses mature at different times during the first year of life and develop at different rates; they serve the function of binding the child to mother and contribute to the reciprocal dynamic of binding mother to child” (p. 351). Bowlby (1973) also viewed emotions as important regulatory mechanisms within attachment relationships, noting, for instance, that anger and protest, as long as they do not become excessive and destructive, can serve to alert the attachment figure to the child’s interest in maintaining the relationship.

These pre-programmed, innate capacities interact with capacities of the caregiver to create a “transactional field” in which development can then take place. Theoretically, the attachment behaviors – behaviors that promote proximity to the attachment figure - observed when a child encounters threats or stressors—for example, vocalizing distress, seeking proximity or clinging to a caregiver, and relaxing once proximity and support are provided—are due to and organized within a hard-wired “attachment behavioral system,” just as a caregiver’s reactions to a relationship partner’s (especially a dependent child’s) distress signals and attachment behaviors are due to and organized within an innate “caregiving behavioral system.” The adaptive behavioral sequences are “activated” by certain stimuli or kinds of situations that make a particular set-goal salient (e.g., sudden loud noises, darkness, illness, the presence of a stranger, sudden movement) and are “deactivated” or “terminated” by other stimuli or outcomes that signal attainment of the desired goal state (emotional support or protection) (Bowlby, 1977). Although infants require physical interaction to develop an attachment to a caregiver, older
children who have increased in cognitive capacity can then form and maintain attachments through visual and verbal contact with the mother, and eventually can depend just upon knowledge of where the mother can be found (Bretherton, 1987). Individual differences in the parents’ mental representation of attachment, mainly the attachment relationship with the parent, are thought to determine their responsiveness to the child's attachment signals and, therefore, to direct the child's socioemotional development. The strength of attachment behaviors is sometimes mistakenly regarded as reflecting the “strength” of the attachment bond. There are striking variations in strength of activation of attachment behaviors across contexts and across children. Yet no evidence exists that these variations in themselves map onto variations in child-mother attachment in any meaningful way (Cassidy, 2016).

The pioneering rodent research that Hofer (1987) and his colleagues conducted over a period of decades shows that regulation of basic bodily processes in infants is multidimensional, meaning that the “attachment system” initially conceptualized by Bowlby as a single, unified system can be characterized in much greater detail. The attachment behavioral system works in tandem with the exploratory behavioral system, which, according to Bowlby, gives survival advantages to the child by providing important information about the workings of the environment: how to use tools, build structures, obtain food, and negotiate physical obstacles. The complementary yet mutually inhibiting nature of the exploratory and attachment systems is thought to have evolved to ensure that while the child is protected by maintaining proximity to attachment figures, he or she nonetheless gradually learns about the environment through exploration. A concept central to attachment theory and first described by Ainsworth is that of an infant’s use of an attachment figure as “a secure base from which to explore”, capturing the links between attachment and exploratory systems (Ainsworth, 1963). The mother’s monitoring of
infant–mother proximity frees the infant from such monitoring and permits greater attention to exploring (Cassidy, 2016).

This system provides the balance between intimacy and exploration in an ever-changing, complex world of new opportunities (Bowlby, 1982; Bretherton, 1992). As attachment behaviors seem to be approach and withdrawal behaviors, Bowlby assumed that attachment behaviors are associated with approach and withdrawal mechanisms. For example, children around 6–9 months withdraw from the negative stimulus and approach their caregivers for security (Marvin and Britner, 1999).

Bowlby’s theoretical focus was the tie to the mother during childhood, and in many cases, the primary attachment figure is the mother, but with changes in caregiving strategies this notion is shifting. The father is also particularly likely to become an additional attachment figure early in the infant’s life. Observational studies have revealed that children use their fathers as attachment figures (Ainsworth, 1967). Also, this “monotropy,” as Bowlby (1988) described it, called the tendency to have one particular attachment figure who clearly stands out from all others, has been challenged by feminists, members of modern societies that depend on professional day care workers, and anthropologists (Mikulincer & Shaver, 2007)

**Internal working models**

Bowlby (1973) proposed that people hold internal working models - internal emotionally-charged cognitive frameworks of the self and others - generated from recurring infant-caregiver interactions. Specifically, these scripts are thought to develop from individual experiences of regulating emotions and distress with caregivers.

Indeed, early, pre-verbal interactions between child and caregiver(s) create a sense of one’s self-worth and of how accessible, reliable, responsive and understanding the caregiver is
Such representations of self and others are a set of knowledge structures which help individuals predict and understand their environment, engage in survival-promoting behaviors, such as proximity maintenance, and establish a psychological sense of “felt” security (Bretherton, 1985). Their content is believed to include knowledge about the details (e.g., what happened, where, and with whom) of interpersonal experiences as well as the affect (e.g., happiness, fear, and anger) associated with those experiences (Bretherton, 1985). With the aid of working models, children predict the attachment figure’s likely behavior and plan their responses.

Internal working models of the self and other can be dichotomized as positive and negative. If the attachment figure has acknowledged the infant’s needs for comfort and protection while simultaneously respecting the infant’s need for independent exploration of the environment, the child is likely to develop an internal working model of self as loved, valued and reliable. Conversely, if the parent has frequently rejected the infant’s bids for comfort or for exploration, the child is likely to construct an internal working model of self as unloved, unworthy or incompetent. If the attachment figure(s) are generally responsive and consistently available, the child learns that others can be counted on when needed and, thus, has a positive working model of others. If these figures are cold, rejecting, unpredictable, frightening, or nonresponsive, however, the child learns that others cannot be counted on for support and comfort, and this knowledge is embodied in negative models of the other. Thus, in attachment theory, past attachment experiences are supposed to crystallize into an internal working model with respect to attachment (Bowlby, 1969).

Moreover, internal working models are assumed to involve processes that influence what information individuals attend to, how they interpret events in their world, and what they
remember. Bowlby (1973) proposed that insecure working models generate dysfunctional biases in the interpretation and response to stress, whereas secure internal working models of attachment are marked by the capacity to access a range of thoughts and feelings in relation to attachment without distortion. Main defined internal working models of attachment in cognitive-affective terms: a “set of conscious and/or unconscious rules for the organization of information relevant to attachment and for obtaining or limiting access to that information, that is, to attachment-related experiences, feelings, and ideations” (Main, Kaplan, & Cassidy, 1985, p. 66). As such, individual differences in attachment quality have been proposed as an important moderator of the extent to which attachment-related information is attended to and processed (Fraley, Garner, & Shaver, 2000; Main, Kaplan, & Cassidy, 1985). Attachment theory posits that the structure (e.g., coherence or integration) and the content (e.g., the belief that relationship partners are generally benevolent) of these cognitive-affective schemas influence expectations and feelings as well as the general patterns of behavior that characterize people's relationships (Diamond & Blatt, 1994; Slade & Aber, 1992).

Essentially, working models become a way to understand oneself as well as oneself in relation to others, and an attachment model involves ideas concerning both self and other. Ainsworth (1969), in discussing this concept, stated: “this implies the formation of intraorganismic structures, presumably neurophysiological in nature, which provide the person with a continuing propensity to direct his attachment behaviors toward specific objects of attachment” (p.971). The internal working models’ concept as a mediator of attachment-related experiences, is the cornerstone of attachment theory (Bretherton & Munholland, 1999).
**Attachment styles**

As the child develops, the internal working models generate an attachment “style”, a complex system of representations, expectancies, and beliefs about the self and others (Ainsworth, 1989; Bowlby, 1980; Collins & Read, 1994). Attachment styles are patterns of expectations, needs, emotions, and social behavior that result from a particular history of attachment experiences, usually beginning in relationships with parents (Fraley & Shaver, 2000). In consequence, attachment theory offers a framework for understanding how people's beliefs and expectations about relationships develop.

Mary Ainsworth empirically verified Bowlby’s work surrounding attachment in a direct and relatively simple way. Ainsworth and her colleagues developed The Strange Situation, a well-known experimental paradigm used to illuminate the difference in attachment or “styles of attachment” (Ainsworth, Blehar, Waters, & Wall, 1978). The “Strange Situation” (now typically capitalized in writings about attachment theory and research, to help readers remember that it is a formal measure, not simply an “odd” situation) triggered the productive flowering of the empirical study of individual differences in attachment quality - the research that is largely responsible for the place of attachment theory in contemporary psychology and psychiatry. This assessment tool allowed her to classify infants’ attachment patterns systematically and relate them to home observations of parent–child interactions. Working with infant-mother dyads, she found that some children were securely attached to their mother while others were insecurely attached. Securely attached infants use the attachment figure or primary caregiver as a secure base from which to explore the environment. These infants are easily soothed by the attachment figure when upset. Insecure children fall into two categories: ambivalent and avoidant. Ambivalent or resistant children, demonstrate ambivalent behavior toward the caregiver. At
times, they may appear clingy and dependent, but at other times reject the caregiver. When distressed, they are difficult to soothe and avoid moving away from caregivers. This behavior results from an inconsistent level of responses to their needs from primary caregivers. Avoidant children do not orient to their caregiver while investigating the environment. Similarly, they do not seek contact with caregivers when distressed. This behavior results from caregiver withdrawal and inaccessibility during distress. Avoidant children exhibit elevated physiological arousal levels despite the appearance of lack of distress (Grossmann, Grossman, & Schwann, 1986). Thus, although they can block the expression of attachment-related behaviors and emotions, it seems that they cannot block the covert activation of their attachment system.

Main and Solomon (1986) built on Ainsworth’s research by studying the small percentage of children who did not fit any of the three described categories. They characterized disorganized/disoriented children, now usually abbreviated as “disorganized”, who display fear, have contradictory behaviors or affects occurring simultaneously, and often use freezing or dissociation (Carlson, 1998). Infants whose attachment behavior in The Strange Situation is rated “disorganized” also show behaviors that are, on the phenotypic level, similar to those indicative of dissociation in adult patients. For instance, in the middle of an approach behavior to the parent, they may suddenly become immobile, unresponsive to the parent’s call, have a blind look, and persist in this state for 30 seconds or more. The disorganized attachment is thought to represent a breakdown in the attachment-care giving partnership such that the child does not have an organized behavioral or representational strategy to achieve protection and care from the attachment figure. Therefore, the disorganized attachment pattern is inconsistent, unlike the three other patterns.
Empirical studies using the Ainsworth Strange Situation paradigm have suggested the relative stability of attachment classifications between the ages of 12 and 18 months (e.g. Vaughn, Egeland, Sroufe, & Waters, 1979; Waters, Merrick, Treboux, Crowell & Albersheim, 2000).

It must be noted that attachment researchers have been blamed of having an ethnocentric bias. Ainsworth’s research began with samples of mother/infant dyads in Uganda, and were later replicated with samples in Baltimore. A meta-analysis conducted by van IJzendoorn and Kroonenberg (1988), including several studies from non-Western populations (Mesman, van IJzendoorn, & Sagi-Schwartz, 2016), found distributions of secure and insecure attachments consistent with Ainsworth’s original finding, but there were contextual determinants of attachment in these global trends, and cross-cultural patterns of attachment are perpetually revisited.

Research suggests that the quality of attachment is strongly interrelated with the acquisition and the development of emotion regulation capacities (Mikulincer, Shaver, & Berant, 2013; Schore, 2016). Attachment styles are thought to develop from individuals’ experiences of regulating distress with attachment figures; hence, these styles reflect strategies that have been learned as ways of dealing with negative affect (Feeney, 1998).

**Health**

Understanding attachment styles has essential implications for health. According to attachment theory, interactions with inconsistent, unreliable, or insensitive attachment figures interfere with the development of a secure, stable mental foundation; reduce resilience in coping with stressful life events; and predispose a person to psychological dysfunction in times of crisis (Bowlby, 1988). The bulk of research on individual differences in attachment has used
Ainsworth’s Strange Situation procedure to classify infants (or infant-parent relationships) at about 12 to 18 months of age and to predict cognitive and social outcomes months or even years later. Indeed, longitudinal studies have shown the significance of child attachment for subsequent development (Grossmann, Grossmann, & Waters, 2006). Therefore, attachment begins in infancy and impacts one’s health and adjustment throughout life. Also, one would expect patterns of attachment to continue through the life cycle as new relationships are affected by internal working models.

**Romantic attachment**

*Uniqueness of romantic attachment*

Over the last 20 years Bowlby’s (1969) attachment theory has become one of the leading theoretical frameworks for the study of emotion regulation, personality development, and interpersonal relationships. Nevertheless, Bowlby dedicated his time to studying infants and children, not adults, even though he did believe attachment was a lifelong process and that it characterized human experience from “the cradle to the grave” (Bowlby, 1977, p. 203).

In adulthood, individuals can form attachment relationships with multiple important people in their lives, including but not limited to romantic partners, siblings, close friends, and children. However, Bowlby considered romantic relationships, specifically, within the same theoretical framework he used to explain infant attachment (Bowlby, 1979). According to Ainsworth (1989), parental figures tend to be permanent members of the attachment hierarchy, but they eventually assume a position secondary in importance to the romantic partner. Another term used by evolutionary psychologists to describe the romantic relationship in humans and other species is pair-bonding, defined a mating pattern in which males and females live together in a relatively permanent fashion.
Research suggests that romantic attachment is a specific kind of attachment distinguishable from other adult attachment relationships. Zeifman and Hazan (1997) administered an interview measuring the four components of attachment to a diverse sample of over 100 adults ranging in age from 18 to 82. The defining features of attachment are the phases of attachment outlined by Bowlby (1969): proximity maintenance (staying near to, and resisting separations from, the attachment figure); separation distress, safe haven (turning to the attachment figure for comfort and support), and secure base (using the attachment figure as a base from which to engage in nonattachment behaviors). Participants were grouped by stage of relationship development. Three relationship status groups were identified: “not in a romantic relationship,” “in a romantic relationship for less than 2 years,” and “in a romantic relationship for 2 or more years.” The majority of participant responses to questions about the target of attachment behaviors were captured by the following categories: parent, adult sibling, friend, and romantic partner. Results showed that adults were clearly peer-oriented in both proximity-seeking and safe-haven behaviors. Nearly all adult respondents preferred spending time with and seeking emotional support from their friends and/or partners rather than their parents. However, the presence of the two other attachment components depended on the length of romantic relationship: participants in romantic relationships of at least two years’ duration overwhelmingly named partners as the individuals whose absence was most distressing and whose presence served as base of security, while those in shorter romantic relationships or not in a relationship named their parents as attachment figures. The results of these studies (and a replication by Fraley & Davis, 1997) are consistent with Bowlby’s hypothesis that attachment behavior typically becomes redirected toward a sexual partner in adulthood and that romantic partners assume the status of principal attachment figures after two years of relationship.
Furthermore, full-blown attachments were observed almost exclusively in two kinds of social relationships - with parents or romantic partners (Zeifman & Hazan, 1997).

Neuroimaging studies have strengthened the claim that romantic partners provide emotional security in adulthood that is not typically provided by other relationships. For instance, compared to photographs of friends, photographs of romantic partners evoked a different pattern of neural activity, implicating regions involved in pair bonding and attachment (Bartels & Zeki, 2000).

**Attachment in the romantic relationship**

It was not until the mid-1980s that researchers began to focus on attachment processes in adulthood and adult psychological dynamics. Hazan and Shaver originally formulated the theory of adult romantic attachment in 1987 whereby romantic love was conceptualized as a form of attachment (Hazan & Shaver, 1987; Shaver & Hazan, 1988; Shaver, Hazan, & Bradshaw, 1988). Through this lens, attachment theory suggests that interactions with one’s romantic partner lead to expectations concerning the degree to which the partner will be consistently responsive, warm, and nurturing to one’s needs (Fraley & Shaver, 2000; Hazan & Shaver, 1994).

There is good evidence that finding a mate and establishing a satisfying romantic relationship are central goals for many people in Western and other modern cultures (Reis & Downey, 1999). In addition, the phenomenon of romantic love appears to be virtually universal across cultures (Schmitt et al., 2009). Hazan and Shaver (1987) argued that romantic love, or pair-bond relationship, involves the integration of three behavioral systems: attachment, caregiving, and sex. The set goal of the caregiving system is to attend another person’s need for felt security by providing sensitive and responsive care, while the goal of the sexual system is impregnation in order to pass one’s genes to the next generation (Mikulincer, 2006). Although
each system serves a different function and has a different developmental trajectory, the three are organized within a given individual and affect each other. For example, beyond its tremendous importance in the initial stages of romantic love, the sexual system plays an important role in the consolidation and maintenance of satisfactory, long-lasting romantic relationships and also impacts self-worth. In addition, a person may forgo his or her sexual desires or needs when feeling distressed or anxious about the whereabouts of a long-term mate. Similarly, a person may adopt sexual strategies (e.g., short-term mating strategies) that serve to inhibit the development of deep emotional attachments (i.e., serve the function of intimacy avoidance and dependency avoidance).

Viewed from this theoretical perspective, love is a dynamic state involving both partners’ needs and capacities for attachment, caregiving, and sex. The optimal functioning of these systems facilitates the formation and maintenance of stable and mutually satisfactory affectional bonds, whereas malfunctioning of these systems creates relational tensions, conflicts, dissatisfaction, and instability and often leads to relationship breakup.

Research findings suggest that romantic love and pair-bonding are evolutionary adaptations (Zeifman & Hazan, 2016). Indeed, the striking similarity between the behavioral manifestations of parent-infant love and romantic love suggests that evolution may have borrowed these ancient bonding mechanisms, originally evolved in mammals to bond mothers to their offspring, and applied them to men and women in the context of romantic pair-bonding.

Romantic love is a biological process designed by evolution to facilitate attachment between adult sexual partners who, at the time love evolved, were likely to become parents of an infant who would need their reliable care. Although the sexual behavioral system evolved to motivate reproductive acts (Buss & Kenrick, 1998), impregnation was frequently not sufficient
in ancestral environments for the survival of human offspring, who have a long period of development and vulnerability. The prolonged inability for the young to move on their own rendered biparental caregiving an adaptive reproductive strategy. That is, selection pressures have produced mechanisms that keep human sexual partners attached to each other so that the two of them can jointly care for their offspring and increase the offspring’s chances of survival and reproduction (Eastwick, 2009; Zeifman & Hazan, 2016). Such mechanisms presumably foster behaviors that promote proximity and affectionate contact (e.g., prolonged eye contact, cuddling, kissing), which distinguish attachment bonds from other types of social relationships (e.g., affiliative relationships) and other types of sexual connections (e.g., one-night stands).

**Conceptualizations of romantic attachment**

Subsequent to the work of Ainsworth, Main, Solomon, and others, evidence was presented to suggest that similar attachment styles exist in adolescence and adulthood (Hazan & Shaver, 1987). Based on a three-category measure, Hazan and Shaver found that the distribution of adult romantic attachment categories was similar to that observed in infancy. In other words, about 60% of adults classified themselves as secure, about 20% described themselves as avoidant, and about 20% described themselves as anxious-resistant.

Similarly to childhood attachments, internal working models in romantic relationships are dynamic representations that offer a disposition toward certain perceptions of others and the self. Internal working models also enable individuals to develop preferred strategies, notably when in the presence of certain threats, to predict and interpret a partner’s behavior and to plan their own response (Collins & Sroufe, 1999). In fact, most researchers who study adult romantic attachment rely on a scheme that explicitly identifies “attachment patterns” or “attachment styles” according to models of self and other (Bartholomew, 1990; Bartholomew & Horowitz,
Conceptual and psychometric investigations of these attachment styles indicate that they can be viewed as regions in a two-dimensional space defined by attachment anxiety and avoidance (Figure 2) (Brennan, Clark, & Shaver, 1998). These two dimensions are supposed to underlie the attachment construct, generating four attachment styles: secure, preoccupied, fearful-avoidant, and dismissing-avoidant. The four styles result by crossing a positive or negative model of the self with a positive or negative model of others (Bartholomew, 1990).

A prototypical secure adult is low on the dimensions of anxiety and avoidance, and thus certain of the perceived responsiveness of their partners, and more comfortable opening up to others. A secure person is comfortable with intimacy and autonomy, and individuals are characterized as secure if they exhibit a positive outlook toward themselves and others. Part of what is learned and represented in the internal working models underlying the secure style is that interpersonal closeness and support for autonomous functioning are mutually sustainable.

![Figure 2. Diagram of the Two Dimensions of Adult Attachment Patterns Showing the Four Styles Suggested by Barholomew (1990) (Fraley & Shaver, 2000, p. 145).](image)

Individuals high in anxiety but low in avoidance are termed “preoccupied” by Bartholomew (1990). This style corresponds conceptually to Main’s enmeshed or preoccupied
attachment pattern, which she described when developing the Adult Attachment Interview that explores adults’ representations of their childhood attachment relationships (George, Kaplan, & Main, 1984). As the name implies, these individuals are preoccupied with relationships, and seek high levels of intimacy, approval, and responsiveness from their partners. Compared to securely attached people, people who are anxious or preoccupied with attachment tend to have less positive views about themselves.

People with a dismissing style of avoidant attachment desire a high level of independence, and this desire often appears as an attempt to avoid attachment altogether. They often deny needing close relationships and seek less intimacy with relationship partners, whom they often view less positively than they view themselves.

Fearful-avoidant or unresolved attachment adults are high in both anxiety- and avoidance-related attachment and hold negative models of the self and others. Fearful-avoidant attachment refers to a type of insecure attachment including features of both the anxious and avoidant categories. Individuals with a fearful attachment indicate a sense of unlovability combined with an expectation that others will be untrustworthy and rejecting. Avoiding close involvement with others enables fearful-avoidant individuals to protect themselves against anticipated rejection by others even if they report a desire for greater engagement (Bartholomew, 1990).

Behavioral patterns and interactions also differ with respect to attachment security. For example, research has demonstrated that anxiously attached individuals display more stress, hostility, and anxiety while interacting with their partner and avoidant individuals behave as less warm and supportive (Simpson, Rholes, Phillips, 1996).
In light of Brennan’s findings on the two dimensions of romantic attachment patterns (Brennan, Clark, & Shaver, 1998), as well as taxometric research published by Fraley and Waller (1998), most researchers currently conceptualize and measure individual differences in attachment dimensionally rather than categorically, working from the idea that attachment styles are more varied and continuous than discrete and trait-like.

Another way to conceptualize romantic attachment is based on one of the core premises of Bowlby’s (1973, 1980, 1982) attachment theory that individual differences in attachment security are crucial for understanding how people deal with stress and distress. Indeed, expectations concerning the degree to which a partner will be responsive facilitate one’s capacity to organize experience and regulate distress when faced with stressful or threatening situations. Recently, Mikulincer and Shaver (2003) proposed an integrative model of the activation and dynamics of the attachment system in adulthood and showed that the model accounts for individual differences in affect regulation, the process by which individuals modulate their affective responses to internal and external stimuli to cope with everyday challenges.

Secure individuals possess accessible internal working models of successful proximity-seeking attempts and secure attainment; thus, they rely on the primary attachment strategy of seeking proximity to an attachment figure that they have internalized as a comforting figure, when one is confronted with a threat. Those who score high on either attachment avoidance or attachment anxiety possess internalized representations of frustrating or unavailable attachment figures and hence suffer from a continuing sense of attachment insecurity. These insecure individuals rely on what Cassidy and Kobak (1988) called secondary attachment strategies, which involve either deactivating or hyperactivating the attachment system with an attempt to cope with threats. Whereas high scores on the attachment avoidance dimension indicate reliance
on deactivating strategies (inhibition of proximity seeking and instead trying to handle stressors alone leading to affect inhibition), high scores on the attachment anxiety dimension reflect hyperactivating strategies - energetic attempts to attain greater proximity, support, and love combined with a lack of confidence that it will be provided, leading to affect heightening. An individual high on both anxiety and avoidance, or fearful-avoidant adults, use both hyperactivating and deactivating strategies often and in a haphazard manner, which can result in inconsistent behavior (Mikulincer & Shaver, 2003).

It is important to mention that these conceptualizations of romantic attachment apply to other types of adult attachment as well.

**Sex differences in attachment**

According to Del Giudice (2011), in most studies, the effects of sex either go entirely untested or are examined only to be controlled for statistically. Sex differences in attachment emerge during development: they are absent during infancy and early childhood, appear in middle childhood and persist into adulthood. In a meta-analysis of sex differences in the avoidance and anxiety dimensions of adult romantic attachment, 113 samples (N = 66,132) from 100 studies employing two-dimensional representations of romantic attachment, Del Giudice (2011) found no sex differences in attachment. However, sex differences were largest in community samples (d = .28), smaller in college samples (d = .12), and smallest in web samples (d = .07), suggesting an age moderating effect. Indeed, there was an interaction of sex and age. There was a linear effect for men, such that the male bias in avoidance increased with age. With respect to women, there was a curvilinear relation with a bias in attachment anxiety peaking between 20 and 30 years of age.
Relations between child and romantic attachment

Perhaps the most provocative and controversial implication of adult attachment theory is that a person's attachment style as an adult is shaped by his or her interactions with parental attachment figures. Indeed, attachment theory proposes that attachment relationships begin in infancy between a child and his or her caretakers and are stably maintained throughout life based on internal working models (Bowlby, 1969, 1973). In other words, a basic postulate of attachment theory is that mental representations of self and others emerge from early relationships with caregivers and then act as heuristic guides for subsequent close relationships (Ainsworth, 1969; Bowlby, 1969, 1973, 1980; Bretherton, 1985). Because they work on the principle of assimilation, directing both attention and behavior, working models tend to remain stable over time, although they may change under some conditions (Bowlby, 1973).

Bowlby (1973) asserted that attachment security can shift over the lifespan when exposed to powerful relational experiences or life events. Although transference of attachment is made from the primary attachment figure to friends and romantic partners, the transference is not perfect because attachment is affected by subsequent relationships. Thus, attachment can change, but it is worth asking to what extent and under what circumstances that can happen.

There are at least two issues involved in considering the question of stability: (a) How much similarity is there between the security people experience with different people in their lives (e.g., mothers, fathers, romantic partners)? and (b) With respect to any one of these relationships, how stable is security over time?

With respect to the first issue, it appears that there is a modest degree of overlap between how secure people feel with their mothers, for instance, and how secure they feel with their romantic partners. In an unpublished study of 215 dating undergraduates, Fraley and Shaver
collected self-report measures of security with a significant parental figure and current romantic partner. The items for each domain were similarly worded and security was scored the same way within each domain. Fraley and Shaver found a correlation of .30 in security across parental and romantic relationships. It is noteworthy that this correlation is virtually identical to that observed by Owens et al. (1995) who employed interview methods to assess parental and romantic security.

The most obvious way to answer questions about the second issue on the influence of infant attachment experiences on romantic attachment patterns is longitudinal analysis. However, because the study of romantic attachment is relatively young, an extensive body of longitudinal data has yet to accumulate. The Minnesota Study of Risk and Adaptation from Birth to Adulthood (Sroufe, Egeland, Carlson, & Collins, 2005) is an ongoing prospective longitudinal study of development and adaptation in children at risk for poor developmental outcomes. This study, which is in its 31st year, finds strong relations between infant attachment, quality of adolescent relationships, as well as adult experience and expression of emotions in emerging adulthood (Simpson, Collins, Tran & Haydon, 2007). Nevertheless, the profile progression is not necessarily straightforward and attachment representations may be modified continuously during successive attachment relationships, as shown in another longitudinal study investigating relationship representation and behavior from infancy to late adolescence in a high-risk sample (Carlson, Sroufe & Egeland, 2004). Correlational analyses demonstrated moderate (early childhood to middle adolescence) to low (middle to late adolescence) continuity in relationship quality. In the Minnesota study, non-familial relationships (e.g. with teachers or peers) have been found to mediate the relation between attachment in childhood and behavior in later romantic relationships. Such mediation has been partial, however, with the impact of early attachment
styles remaining a significant predictor of later behavior (Sroufe, Egeland, Carlson, & Collins, 2005). Another longitudinal study (Waters, Merrick, Albersheim, & Treboux, 2000) monitored 50 individuals for 20 years from the ages of 12 months to 20-22 years. Finding revealed 64% of stability in attachment classifications: specifically, greater than 70% stability for individuals with no major negative life events and less than 50% stability for those who had lost a parent, endured parental divorce, or other adverse childhood event. Thus, life events moderate the stability of attachment classifications.

In adulthood, the continuity of attachment styles has also been examined by longitudinal studies. Benoit and Parker (1994) showed that 90% of their sample of 84 Canadian mothers received the same AAI classification across a 1.5-year period. Also, Kirkpatrick and Hazan (1994), in a sample of adults ranging in age from 18 to 79, found 70% continuity in attachment styles over four years. In an extension of the latter study, however, Lopez and Gormley (2002) found 57% attachment stability in students transitioning to the first year of college.

Research on the issue of stability of attachment representations is equivocal, and represents the debate among researchers between conceptualizing the stability of attachment representations as prototype-like models, whereby a prototype of attachment is developed early in childhood which influences dynamics significantly throughout the life course, or revisionist models, asserting that early representations are subject to modification on the basis of new experiences and therefore may or may not reflect patterns of attachment later in life.

Research on both child and adult attachment has increased in the past decade and has focused on examining 1) the relation between childhood attachment experiences and parenting behavior, and intergenerational transmission of attachment patterns; and 2) the impact of childhood attachment experiences on adult relationships.
**Health and romantic attachment**

Similarly to child attachment, romantic attachment has been significantly related to a variety of health outcomes, and thus, the quality of close relationships has a powerful influence on physical and mental health. Cross-sectional data from the National Comorbidity Survey Replication (N = 5645) supported the theory that insecure attachment is a risk factor for the development of disease and chronic illness, particularly conditions involving the cardiovascular system (McWilliams & Bailey, 2010). Moreover, Mikulincer and Shaver (2007) reviewed hundreds of cross-sectional, longitudinal, and prospective studies of both clinical and non-clinical samples and found that attachment insecurity was common among people with a wide variety of mental disorders, ranging from mild distress to severe personality disorders and even schizophrenia. Also, attachment to romantic partners has been related to sexual risk behaviors, such as sex at an early age, multiple sexual partners, and unsafe sex (Ahrens, Ciechanowski, & Katon, 2012; Bogaert & Sadava, 2002; Feeney, Kelly, Gallois, Peterson, & Terry, 1999; Gentzler & Kerns, 2004; Stefanou & McCabe, 2012). Finally, the links between attachment phenomena in childhood and psychopathology in adulthood, including depression, substance abuse/dependence, and eating disorders, have been substantiated (Dozier, Sovall-McClough, & Albus, 2008). Because of the range and importance of such findings, one would expect attachment to impact sleep functioning. Indeed, attachment and sleep are both intricately linked to emotion regulation.

**Sleep and attachment**

Despite the extensive literature investigating the role of attachment style in various conditions pertaining to mental and physical health, very little attention has targeted its relation to sleep. Both sleep and attachment are critical domains of human functioning and development.
They develop around the first year of life, are highly influenced by interactions with caregivers, and are considered to be important biopsychosocial regulators of development. A considerable amount of conceptual and empirical work has considered how these systems may be mutually influencing among infants and toddlers, especially considering infants spend most of their time sleeping (Beijers, Jansen, Riksen-Walraven, & de Weerth, 2011; Bélanger, Bernier, Simard, Bordelau, & Carrier, 2015; Keller, 2011; Morrell & Steele, 2003). It is hypothesized that the progressive organization of sleep and wakefulness at night in infancy reflects the integration of constitutional propensities of the infant (temperament) in interaction with the infant's multiple contexts, which, in turn, are mediated by the infant's primary relationships. Thus, the regulation of infant states, such as sleep, wakefulness, and crying, is particularly sensitive to dyadic interaction – also called a transactional interaction - within an individual infant's biological limits (Calkins & Hill, 2007; Cole, Martin, & Dennis, 2004; Scher, 2002; Sroufe, 2005).

As early as in pre-verbal infancy, a relation between attachment-related phenomena and sleep elements was shown, as Emde and Koenig (1969) found that the earliest smiles of the human infant arise out of transient REM states and are thus a special instance of the phasic phenomena of that state. In addition, research shows that sleep-related neurobehavioral systems overlap and interact with those involved in the control of affect and attention (Dahl, 1996).

Different conceptual explanations for the relation between sleep and attachment have been formulated (Keller, 2011). One theoretical approach to understand this association has been to incorporate sleep-wake patterns into the repertoire of attachment behaviors. According to this view, bedtime resistance, night wakings, and similar sleep disruptions are simply manifestations of attachment behavior in much the same way as behavioral and emotional reactions to separation and reunion with the attachment figure. In Western nations, infants and children are
typically expected to sleep in locations separate from their caregivers (McKenna, 1996); and even in co-sleeping contexts, the unconscious state, aloneness, and darkness associated with sleep represents a condition of significant vulnerability and psychological separation from caregivers. Thus, going to sleep represents a separation and triggers activation of the attachment system, and waking up is a reunion, therefore waking in the morning as well as in the middle of the night is an opportunity to obtain comfort (Sameroff & Fiese, 1990). The nature of the attachment behaviors triggered in both the caregiver and the infant in separation and reunion around sleep is instrumental in shaping the infant’s expectations about what happens at when sleeping and waking up and is a factor likely to be associated with infant and childhood sleeping problems (Anders, 1994; Moore, 1989).

A variant on this view is the perspective that sleep disruptions are the result of attachment insecurity. In this model, the link between attachment and sleep makes clear the benefit of understanding attachment as part of the broader framework of emotion regulation. Attachment theorists have noted the ways in which the regulation of emotions is used in the service of maintaining the relationship with the attachment figure, and they have noted that individual differences in attachment security have much to do with the ways in which emotions are responded to, shared, communicated about, and regulated within the attachment relationship (Thompson, 2016). Most of the rhetoric about self-regulation gives the illusion that regulation is a property of the individual, but it must be emphasized that self-regulation can only occur if there is a social surround that is engaged in "other regulation" (Sameroff & Fiese, 2000). It is this regulation by others that provides the increasingly complex social, emotional, and cognitive experiences to which the child must self-regulate and the safety net when self-regulation fails. Even early functional physiological self-regulation of sleep, crying, and attention is augmented
by caregiving that provides the child with regulatory experiences to help him or her quiet down on the one hand and become more attentive on the other (Sameroff, 2009). Maunder and Hunter (2001, 2008) support this idea by stating that the mental representations of insecure attachment are strongly linked to the regulation of affect and may lead to disease risk by altering stress physiology and playing a role in the initiation (or non-initiation) of a stress cascade along with a modification of its intensity or duration.

When applied to the sleep context, the increased self-regulatory capacities may translate into more efficient self-soothing at sleep onset or during night waking and thus enhanced capacity to fall asleep rapidly without intervention by a caregiver (Keller, 2011). Avoidant children may sleep longer because sleep involves a separation from the other and signifies maximum self-reliance. Subsequent to separation, avoidant children are likely to decrease their night waking and quickly fall back to sleep. Anxious-ambivalent children may evince high night waking and difficulty falling asleep. Infants classified as avoidant down regulate or suppress and inhibit their attachment needs due to fear of rejection based on a history of insensitive maternal care, whereas infants classified as ambivalent exaggerate and amplify their attachment needs based on a history of inconsistent care (Cassidy & Berlin, 1994).

Furthermore, Dahl (1996) proposed that the process leading to sleep is based on a distinct decrease of alertness and vigilance, requiring that individuals feel a sense of safety and emotional security sufficient to surrender to sleep. Overall, hyperarousal is assumed to play a central role in the development and maintenance of sleep disturbances (Morin, 1993; Perlis, Giles, Mendelson, Bootsin, & Wyatt, 1997); and the affective state of insecurity, which is often reflected among anxious-ambivalent children, is characterized by heightened vigilance and sense of threat, is antithetical to the sleep state.
In three longitudinal studies, infants who showed insecure ambivalent attachment patterns were those who demonstrated the greatest degree of anxiety, distress, and difficulty regulating emotion in response to separations from caregivers at bedtime, when compared to either avoidant or securely attached infants (Beijers, Jansen, Riksen-Walraven, & de Weerth, 2011; McNamara, Belsky, & Fearon, 2003; Morrell & Steele, 2003). By contrast, insecure-avoidant children exhibited fewer night wakings during nighttime at 6 and 15 months of age and shorter night wakings at 15 months (Beijers, Jansen, Riksen-Walraven, & de Weerth, 2011; McNamara, Belsky, & Fearon, 2003). Taken together, these studies indicate that anxious attachment in particular is linked to sleep disruptions. However, most studies included infants and there is therefore little understanding of relations in middle childhood or adolescence.

There are a similar number of studies linking romantic attachment with adult sleep functioning, and the intimate link between insecure attachment and sleep difficulties in adults is emphasized. Verdecias and colleagues reported that individuals characterized by a preoccupied attachment style were likely to report elevated rates of daytime napping and the use of sleep-inducing medications (Verdecias, Jean-Louis, Zizi, Casimir, & Browne, 2009). Scharfe and Eldredge (2001) found that, among college students, higher scores on fearful and preoccupied attachment styles (both being high on attachment anxiety) were associated with poor subjective sleep quality. Other studies bolster the idea that individuals high in attachment anxiety (i.e. preoccupied or fearful) are particularly at risk for poor sleep quality (Carmichael & Reis, 2005; Diamond, Hicks, & Otter-Henderson, 2008; Maunder, Hunter, & Lancee 2011).

Studies on individuals with dismissing-avoidant attachment indicate different results: one reports a significant relation between dismissing attachment and poor sleep quality (Adams & McWilliams, 2015) and others show that dismissing individuals had poorer self-reported sleep
quality than secure individuals (Escolas, Hildebrandt, Maiers, Baker, & Mason, 2013; McNamara, Pace-Schott, Johnson, Harris, & Auerbach, 2011). Others report no significant association between avoidance and sleep quality (Carmichael & Reis, 2005), and it appears that whether individuals are in a committed relationship impacts the attachment-sleep relation, whereby dismissing individuals who were not in relationships had poorer sleep quality (Scharfe & Eldredge, 2001). More recent studies found a link between attachment avoidance and poor sleep quality, including negative dream content (Selterman & Drigotas, 2009), but did not examine the interaction between anxiety and avoidance, and therefore, did not differentiate between fearful and dismissing individuals (Hsiao et al., 2013; Maunder, Hunter, and Lancee, 2011).

It is important to consider the results on attachment avoidance with caution as in some studies, such as Adams and McWilliams’s (2015), Hazan and Shaver’s forced-choice measure (1987) was used. It categorizes individuals into three attachment styles: secure, avoidant, and anxious; thus, dismissing-avoidant and fearful-avoidant may be grouped under the same classification of “avoidant” which makes it difficult to clarify the nature of each style in relation to sleep. Thus, it is likely that dismissing individuals have poor sleep quality, but also that fearful-avoidant attachment is significantly associated with poor sleep quality, as opposed to dismissing-avoidant.

Only four studies have investigated the association between attachment patterns and measures of sleep architecture. Troxel and his colleagues reported that, among depressed women, those with higher levels of attachment anxiety had a lower percentage of stage 3/4 sleep and shorter sleep latencies (Troxel, Cyranowski, Hall, Frank, & Buysse, 2007). In another study, an association between anxious attachment and the persistence of alpha activity during light
sleep (also called the Alpha-EEG anomaly) was reported (Sloan, Maunder, Hunter, & Moldofsky, 2007). Moreover, based on REM sleep’s brain activation patterns and its participation in consolidation of emotional memories, McNamara and his colleagues tested the hypothesis that measures of REM sleep architecture and REM sleep-related mentation would be associated with attachment orientation. Relative to participants classified as having secure attachment orientations, participants classified as anxious took less time to enter REM sleep and had a higher frequency of REM dreams with aggression and self-denigrating themes. There were no significant differences across attachment groups in other measures of sleep architecture or in post REM-sleep awakening ratings on scales reflecting mood and alertness (McNamara, Pace-Schott, Johnson, Harris, & Auerbach, 2011). Finally, a study on military veterans indicated that greater attachment anxiety was associated with increased relative beta power (i.e. the distribution of signal power over frequency) during NREM sleep, which characterizes arousal and a lack of sleep depth, while greater attachment avoidance was associated with delta power during NREM and REM sleep, which characterizes sleep depth (Troxel & Germain, 2011).

These studies support the essential idea that high attachment anxiety, which is characterized by “hyperactivating” strategies during times of threat or stress, may predispose an individual to sleep problems by influencing stress arousal systems and cognitions related to the emotional and physical availability of the partner. By contrast, secure attachment (low levels on anxiety and avoidance dimensions) may promote deeper, more restorative sleep by providing a sense of safety and security and allowing the individual to physiologically and psychologically ‘unwind’ from the stresses of the day. The sleep of dismissing individuals may be similarly protected because of their tendency to use ‘deactivating’ strategies, including valuing autonomy.
and suppressing needs for closeness. However, the different findings on the sleep of dismissing people suggest that deactivating strategies do not necessarily lead to good sleep quality.

Review of the extant literature suggests a complex interaction between negative affect (e.g., anxious and depressed emotions) and sleep disturbances in adulthood (Kirkegaard Thomsen, Yung Mehlsen, Christensen, &Zachariae, 2003). For instance, individuals suffering from insomnia or psychiatric patients who show poor sleep quality often go through periods of rumination and exhibit depressive traits (Kales, Caldwell, Soldatos, Bixler, & Kales, 1983). Indeed, pre-sleep worries, a concept similar to rumination, constitute the main reason why individuals with insomnia are unable to fall asleep (Harvey, 2000). Interestingly, rumination and depressive traits are often observed among individuals who are classified as having a preoccupied or fearful attachment (Cummings & Cicchetti, 1990). Another remarkable finding is that, in a cross-sectional study on married adults, although attachment avoidance was associated with poorer sleep quality among wives, when depression and attachment anxiety were controlled, no significant association between attachment avoidance and poorer sleep quality remained. Such results elucidate part of the inconsistent findings on the relation between dismissing attachment and sleep functioning (Carmichael & Reis, 2005). These results also support the idea that sleep is used by some individuals as a defensive strategy to manage depressed or anxious affect.

In sum, studies relating child attachment to infant or toddler sleep, and studies showing an association between romantic attachment and adult sleep functioning are significant in strengthening the attachment-sleep link. Nevertheless, it is surprising that there are virtually no studies directly investigating both child and romantic attachment in relation to sleep quality, and the model that links child and romantic attachment to sleep quality needs to be identified.
Furthermore, it is important to note that the only studies showing a significant relation between 
dismissing attachment and poor sleep were conducted among adults and most studies on sleep 
and attachment concern only those in romantic relationships. Results of Scharfe and Eldredge’s 
study (2001) suggest that further research should consider the sleep of dismissing individuals not 
in relationships. In addition, studies rarely examine sex differences in the attachment-sleep link, 
which may clarify findings on this relation.

**Study**

The first aim of the present study is to critically examine the nature of the relation 
between child attachment, adult attachment as defined romantically, and sleep quality, and thus, 
to delineate the importance of each type of attachment in their association with sleep quality. I 
will test a theoretical model concerning how child and romantic attachment are related to sleep 
quality, hypothesizing that romantic attachment explains the relation between child attachment 
and sleep quality (see Figure 3). The second goal of this study is to examine the relation between 
romantic attachment styles and sleep quality, adjusting for marital status and length of romantic 
relationship, given the significant finding that dismissing attachment is linked to poor sleep 
quality in those not in committed relationships (Scharfe & Eldredge, 2001). Because of sex 
differences found in child and romantic attachment, these hypotheses will be examined for men 
and women separately.

![Figure 3. Relative Importance of Romantic Attachment in Predicting Sleep Quality.](image-url)
Hypothesis 1: Romantic attachment significantly and positively explains the association between child attachment scores (higher scores indicate less security) and poorer sleep quality so that this association is weakened in the presence of romantic attachment.

Hypothesis 2: Dismissing or secure romantic attachment is related to good sleep quality while preoccupied or fearful romantic attachment is related to poor sleep quality.
METHODS

The proposed study was part of a larger study investigating the contributions of child and adult attachment to various health outcomes. This study, titled “Health and Love” (HAL), took place at the City University of New York under the supervision of Dr. Margaret Rosario. The project started in October 2013 and ended in January 2016.

Participants

The HAL study recruited residents of the United States, who represent both sexes, three developmental groups (emerging adults aged 18-25 years, early adults aged 26-39 years, and middle adults aged 40-65 years), and all sexual orientations. Adolescents (ages 12-18) were excluded from the study as they are in the stages of identity formation (Erikson, 1968), and therefore romantic attachment has not yet developed. Another exclusion criterion was being over the age of 65, because, in late adulthood, loss of attachment figures significantly alters attachment figures. Furthermore, non-English speakers were excluded because the questionnaires were available only in English. Also, individuals who reported being diagnosed with psychosis or schizophrenia were excluded from the study because of the likelihood of impaired thought process. Finally, lesbian, gay, and bisexual individuals were not considered in this specific report, which only included heterosexual individuals.

After being screened, and out of 907 eligible individuals, 688 consented to the study. Seventeen participants failed the data checks (including checking for reliable reporting of age), thus the final sample consisted of 671 participants.

Procedure

The cross-sectional HAL study was approved by the Institutional Review Board of the City University of New York. Recruitment took place via various social media platforms online, from January 2015 to January 2016. Most of the participants ($n = 505, 75.2\%$) learned about the
study via Reddit, while the rest were referred through Facebook \((n = 92, 13.7 \%)\), Craigslist \((n = 54, 8.2 \%)\), and other sources \((n = 19, 2.9 \%)\), such as Google or a friend. Various electronic flyers were posted on groups and pages relevant to the target population. When potential participants clicked on the electronic link to the study, they were taken to Psychdata, a secure online survey software tool used to conduct internet-based research (Locke & Keiser-Clark, 2001). There, participants started a screening which took a maximum of 2 minutes, preceded by an internet-based informed consent form for the screener. If they were determined ineligible for the study, they were so informed and thanked for their time. Their data were retained for reporting purposes. If they were eligible, they proceeded to the informed consent form and questionnaire battery. Some individuals were selected randomly to receive an online gift card as a thank you for participating.

To maintain confidentiality, data on participants were de-identified and they were assigned numeric codes. The document linking the codes to participants’ names, their contact information, and documentation of informed consent was kept in a separate, protected location.

Measures

A questionnaire battery or survey was developed for the HAL study containing a range of measures. Only the ones relevant to the current study are described below. Items were added to the battery to identify online trolls and repeat participants.

Screening questionnaire

This questionnaire determined study eligibility. It consisted of socio-demographic questions and issues related to various identities in order to generate study groups and understand potential refusal patterns (e.g. sex, age).
**Socio-demographic questionnaire**

Basic demographic characteristics (e.g. sex/gender, age, race/ethnicity, living situation, marital status) were assessed to describe the sample, examine potential correlates of attachment, and confirm responses to the screening questionnaire. Markers of social class, such as income and educational assessment, were also assessed. Length of current romantic relationship was also considered in this study as individuals who had been in their relationships for longer were more likely to direct attachment needs toward their partners, potentially impacting romantic partner attachment scores.

**Attachment**

*The Experience in Close Relationships – Relationship Structures*

The Experience in Close Relationships—Relationship Structures (ECR-RS) (Fraley, Heffernan, Vicary, and Brumbaugh, 2011) was used to assess child and romantic attachment. Brennan, Clark, and Shaver (1998) developed the thirty-six item Experiences in Close Relationships (ECR) and an iteration of the instrument led to defining two sub-scales, avoidance and anxiety. Fraley, Wallace and Brennan (2000) used Item Response Theory to improve on the ECR, generating the Experiences in Close Relationships-Revised (ECR-R) questionnaire, also a thirty-six-item measure that organizes data into avoidance and anxiety subscales. Both the ECR and ECR-R have been widely used when assessing attachment. However, administering the thirty-six-item questionnaire for each target placed a large burden on the test-taker. In their comprehensive report based on over a decade’s worth of research and development on the ECR-RS, Fraley and his colleagues explained how this new iteration addresses the following issues: eliminates previously referentially ambiguous attachment figures by naming distinct significant others; opens the once narrow domain of romance to provide a wider look at attachment, by
modifying questions targeting only one’s romantic partner (“When my partner is out of sight, I worry that he or she might become interested in someone else”); assesses four relationship domains in thirty-six questions, keeping the measure from being unwieldy and burdensome; allows subjects to reveal more complexity about their relationships with within-person variability in attachment (Fraley, Heffernan, Vicary, & Brumbaugh, 2011). Working from the idea that attachment styles are more varied and continuous than discrete and trait-like, the ECR-RS has bridged nuanced aspects of attachment theory with attachment self-measures.

The ECR-RS poses nine attachment-related questions across four significant and distinct relationship domains, assessing levels of avoidance (discomfort with closeness and dependence) and anxiety (fear of rejection and abandonment) in relation to the individual’s mother or mother-like figure, father or father-like figure, romantic partner, and friend; thus, the ECR-RS seeks a more comprehensive view of an individual’s attachment style than earlier self-report measures of attachment. The same 9 items are used to assess attachment styles with respect to the four attachment figures. An example of an item on the ECR-RS includes: “it helps to turn to this person in times of need”. The Likert response scale ranges from strongly disagreeing (1) to strongly agreeing (7), and thus 1 represents a low score for both anxiety and avoidance while 7 is a high score. Of the 9 items for each attachment figure, the avoidance score is comprised of the mean of items 1-6 with 1-4 reverse keyed; the anxiety score is comprised of the mean of items 7-9.

The reliability and validity of the ECR-RS have been demonstrated (Fraley, Heffernan, Vicary, & Brumbaugh, 2011). Also, the authors mark 4 as a middle point between the extremes of the continuum, and note that most people in the large samples they tested were found to be
relatively secure with a score below 4. Aside from noting this fact, norms have not been set for this measure.

For the purposes of the current study, the ECR-RS was modified to assess attachment styles with respect to 3 targets as opposed to 4: mother, father, and romantic partner. In addition, attachment styles in the relationships with mother and father were assessed in the past to capture child attachment prior to age 13. Also, an inclusive definition of “mother” was used, including guardian, step-mother, and primary female caretaker; the same was done for “father”.

To create a parent-child attachment score, the scores across domains of anxiety and avoidance for mother and father were averaged. The parental avoidance score is the mean of avoidance with mother and father. Similarly, the parental anxiety score is the mean of anxiety with mother and father. It is noteworthy to mention that this particular method weights each relationship domain equally. This measurement strategy was recommended by Fraley and his colleagues when developing the ECR-RS (Fraley, Heffernan, Vicary, & Brumbaugh, 2011) and was used in their studies (Fraley, Niedenthal, Marks, Brumbaugh, & Vicary, 2006).

The present data showed that the anxiety and avoidance subscales for child attachment to the mother and to the father, and for adult attachment to the romantic partner, had excellent internal consistency, with reliabilities ranging from $\alpha = 0.91$ to $\alpha = 0.93$.

Taxometric analyses suggest that variation in attachment is best modeled with dimensions rather than categories (Fraley & Waller, 1998). Thus, the ECR-RS’s data was analyzed continuously when testing hypotheses 1 and 2.

*The Jaccard*

The Jaccard, a measure of satisfaction with the parental relationship, that consists of 9 items and a 5-point Likert response scale ranging from 1 (“Strongly Agree”) to 5 (“Strongly
Disagree”) (Jaccard & Dittus, 2000; Jaccard, Dittus, & Gordon, 1996), has been found to be a valid measure of child attachment (Rosario et al., 2014). The Jaccard was administered to establish construct validity of the ECR-RS in measuring child attachment. Participants indicated the degree to which they were satisfied with a range of relationship elements, such as general communication, affection, conflict resolution, and respect in their relationship with their mother and father before the age of 13. Thus, the instructions were reworded to refer to the past. The overall attachment score was the sum of the individual items’ scores, with higher scores representing less secure attachment. In the current study, a sub-sample of 38 participants were given the Jaccard along with the main questionnaire battery, and another sub-sample of 32 individuals completed the measure several months later. Because no significant differences in attachment to either the mother or the father were found between the two, the sub-samples were combined, resulting in 70 cases. Cronbach’s alpha was 0.98 for maternal attachment and 0.96 for paternal attachment. Similar to the use of the ECR-RS, the scores for maternal and paternal attachment were averaged, leading to a combined parental attachment score.

**Sleep quality**

The Pittsburgh Sleep Quality Index (PSQI), a widely used and well-validated measure of sleep quality and disturbances (Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989), was used to measure sleep. The PSQI consists of 19 self-reported items that assess seven components of sleep quality over 1 month. Each component involves a composite score of one to three questions, with each question score being weighted equally on a 0-3 scale. A score of “0” indicates no difficulty, while a score of “3” indicates severe difficulty.

The components of sleep quality are: subjective sleep quality, sleep latency, duration, efficiency, disturbances, use of sleep medication and daytime dysfunction. Such components are
standardized versions of areas routinely assessed with clinical interviews of patients with sleep/wake complaints for the majority of days and nights during the past month. Subjective sleep quality is the perceived sleep quality as the individual rates his or her sleep. Sleep latency is the amount of time it takes one to fall asleep, and this component incorporates the reason behind the difficulty to fall asleep. Sleep duration refers to the number of hours one slept at night, while sleep efficiency is the ratio of time spent asleep to the total amount of time spent in bed. Disturbances in sleep are assessed by how often one has had trouble sleeping because of a number of reasons listed in the questionnaire, such as having to get up to use the bathroom, or having bad dreams. Use of sleep medication is the degree to which one used prescribed or over the counter medicine to help get to sleep. Daytime dysfunction refers to trouble staying awake or keeping enthusiasm to get things done due to sleepiness. The seven components’ scores are then summed to yield a global sleep quality score, which has a range from 0 to 21. Higher scores indicate worse sleep quality.

A cutoff score of 5 has been shown to discriminate between good and poor sleepers, the latter experiencing clinical sleep disturbance. A global PSQI score > 5 yielded a diagnostic sensitivity of 89.6% and specificity of 86.5% (kappa = 0.75, p < 0.001) in distinguishing good and poor sleepers among groups of healthy subjects, poor sleepers, and sleep-disordered patients (Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989). A cut-off of 6 was recommended to be used by some (e.g., Backhaus et al., 2002) in order to maximize specificity while only modestly reducing sensitivity.

In a cohort of patients of differing clinical status, the mean global sleep quality score in healthy patients was 2.7; in patients with excessive somnolence, it was 6.5; in patients with
difficulties initiating or maintaining sleep, it was 10.4; and in patients with depression, it was 11.1 (Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989).

In the current sample, the internal consistency for the PSQI was $\alpha = 0.71$.

**Data analysis**

All analyses were conducted using IBM SPSS Statistics, version 23. Incomplete cases were dropped on an analysis-by-analysis basis with pairwise deletion. Descriptive statistics were calculated for all the study variables, and all variables were found to be normally distributed: there was no evidence of skewness or kurtosis, as in women, they ranged from -1.53 ($SE = 0.13$) to 1.43 ($SE = 0.13$) and from -1.89 ($SE = 0.2$) to 1.74 ($SE = 0.26$), respectively, and in men, they ranged from -1.9 ($SE = 0.14$) to 1.18 ($SE = 0.14$) and from -1.94 ($SE = 0.28$) to 1.63 ($SE = 0.28$), respectively.

All covariates which were examined, namely age, ethnicity/race, education, income, marital status, length of current romantic relationship, and recruitment site, were significant with attachment and sleep scores for women, men, or both, and were therefore adjusted for in analyses of the two hypotheses. All analyses were stratified by sex.

Regressions equations were used to examine the proposed model of Hypothesis 1 and the MacArthur rules for mediation were used (Kraemer, Kiernan, Essex, & Kupfer, 2008). The MacArthur approach stipulates that there should be a significant relation between the target variable, child attachment and sleep quality, and that child attachment must temporally precede and be related to the hypothesized mediator, romantic attachment. The mediation is established either by a main effect of romantic attachment on sleep quality or an interaction between child and romantic attachment. To compute the indirect effect of child attachment on sleep by means of romantic attachment, two models for women and men were tested using Hayes’ (2013)
PROCESS procedure, an updated version of Preacher and Hayes’ (2004) procedure for bootstrapping tests of mediation. In the first model, the independent variable was child attachment avoidance. In the second model, the independent variables was child anxious attachment.

Hypothesis 2 was tested using a series of hierarchical regression analyses in which romantic attachment avoidance and anxiety were entered in the first step, followed by interactions between avoidance and anxiety in the second step. Each main effect was centered about its mean before the product term was computed.
RESULTS

Demographic characteristics of the sample

The age groups, race/ethnicity, education, income, marital status, length of current romantic relationship, and recruitment site of men, women, and the full sample are presented in Table 2 (p. 59). The sample was predominantly White, with more women than men, and almost half of individuals were in a formalized heterosexual relationship, either married or in a domestic partnership. The mean age of the sample was 32 years ($SD = 11.29$) and all adult age groups were represented: a third of the participants were emerging adults (18-25), close to half were in early adulthood (26-39), and around a quarter were middle adults (40-65). Very few ($n = 31, 4.8\%$) participants were first-generation immigrants to the United States, yet others differed in nativity status depending on where their parents’ and grandparents’ were born: 6.3 % ($n = 40$) were second-generation, a quarter ($n = 165, 25.8\%$) were third-generation, and 63 % ($n = 404$) were fourth-generation or greater. Other than the United States ($n = 601, 93.2\%$), individuals’ countries of origin which were represented in the study included but were not limited to Canada ($n = 12, 1.9\%$), China ($n = 3, 0.5\%$), Taiwan ($n = 2, 0.3\%$), Germany ($n = 2, 0.3\%$), and Ireland ($n = 2, 0.4\%$).

Half ($n = 339, 50.5\%$) of the participants lived in a suburban area, a third ($n = 227, 33.8\%$) lived in an urban area, and the rest ($n = 105, 15.6\%$) were in a rural area. Most individuals ($n = 657, 97.9\%$) lived in a house or an apartment, and a minority ($n = 14, 2\%$) lived in a hotel, the streets, a college dormitory, or in changing environments (e.g. one night here, another there). Eighty-one percent ($n = 521$) lived with at least another person, including a spouse ($n = 295, 56.2\%$), roommate ($n = 101, 19.2\%$), mother ($n = 93, 17.7\%$), and a friend ($n = 73, 13.9\%$). The majority of the sample were employed and worked either full-time ($n = 377, 55.3\%$) or part-time ($n = 91, 13.3\%$); 15 % ($n = 102$), were students, 15.2 % ($n = 104$) were unemployed, and 1.2 %
(n = 8) were retired. The median annual household income fell in the $61,000 – $80,000 bracket (SD = 1.99). With respect to individuals’ educational attainment, 34.4% (n = 220) completed some college, while 55.9% (n = 360) had a Bachelor’s or higher degree.

A majority of the participants had had a romantic partner in their lives (79.6%, n = 211). A major proportion of the sample (n = 434, 67.3%) had a romantic partner at the time of data collection and 80.2% (n = 343) of those had been with their partner for at least a year. Among those that were not in a romantic relationship, around half (n = 79, 47.4%) had their most recent relationship end less than a year ago, while 35.9% (n = 60) ended their last relationship more than a year ago, but less than five years ago and around 16.8% (n = 28) had their last relationship end more than five years ago.
Table 2. Descriptive Analyses of Study Variables.

<table>
<thead>
<tr>
<th>Demographic marker</th>
<th>Total Sample (N = 671)</th>
<th>Women (N = 377)</th>
<th>Men (N = 294)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18-25</td>
<td>238 (35.3)</td>
<td>126 (33.4)</td>
<td>112 (38.1)</td>
</tr>
<tr>
<td>26-39</td>
<td>281 (41.6)</td>
<td>155 (41.1)</td>
<td>126 (42.9)</td>
</tr>
<tr>
<td>40-65</td>
<td>152 (23.0)</td>
<td>96 (25.5)</td>
<td>56 (19)</td>
</tr>
<tr>
<td><strong>Race/Ethnicity</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>White</td>
<td>537 (81.3)</td>
<td>301 (80.7)</td>
<td>236 (82.2)</td>
</tr>
<tr>
<td>African American/Black</td>
<td>22 (3.5)</td>
<td>14 (3.8)</td>
<td>8 (2.8)</td>
</tr>
<tr>
<td>Asian</td>
<td>39 (5.9)</td>
<td>22 (5.9)</td>
<td>17 (5.9)</td>
</tr>
<tr>
<td>Native Hawaiian or other Pacific Islander</td>
<td>1 (0.2)</td>
<td>1 (0.3)</td>
<td>0</td>
</tr>
<tr>
<td>Native American or Alaska Native</td>
<td>1 (0.2)</td>
<td>0</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>Multi-Racial</td>
<td>21 (3.2)</td>
<td>13 (3.5)</td>
<td>8 (2.8)</td>
</tr>
<tr>
<td>Hispanic</td>
<td>39 (5.9)</td>
<td>22 (5.9)</td>
<td>17 (5.9)</td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Never Attended School</td>
<td>1 (0.2)</td>
<td>1 (0.3)</td>
<td>0</td>
</tr>
<tr>
<td>Some School (Less than High School)</td>
<td>6 (1)</td>
<td>4 (1.1)</td>
<td>2 (0.8)</td>
</tr>
<tr>
<td>High school diploma or GED</td>
<td>55 (8.6)</td>
<td>16 (4.4)</td>
<td>39 (14)</td>
</tr>
<tr>
<td>Some college, or Associate's degree</td>
<td>220 (34.4)</td>
<td>129 (35.5)</td>
<td>91 (32.6)</td>
</tr>
<tr>
<td>Bachelor's degree</td>
<td>192 (30.0)</td>
<td>104 (28.7)</td>
<td>88 (31.5)</td>
</tr>
<tr>
<td>Some graduate school</td>
<td>64 (9.8)</td>
<td>40 (11.0)</td>
<td>24 (8.6)</td>
</tr>
<tr>
<td>Post-graduate degree</td>
<td>104 (16.1)</td>
<td>69 (19)</td>
<td>35 (12.5)</td>
</tr>
<tr>
<td><strong>Income</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$ 0 - 10,000</td>
<td>45 (6.9)</td>
<td>28 (7.7)</td>
<td>17 (6.2)</td>
</tr>
<tr>
<td>$ 11,000 - 20,000</td>
<td>46 (7.3)</td>
<td>33 (9.1)</td>
<td>13 (4.7)</td>
</tr>
<tr>
<td>$ 21,000 - 40,000</td>
<td>114 (17.9)</td>
<td>68 (18.7)</td>
<td>46 (16.7)</td>
</tr>
<tr>
<td>$ 41,000 - 60,000</td>
<td>114 (17.7)</td>
<td>68 (18.7)</td>
<td>46 (16.7)</td>
</tr>
<tr>
<td>$ 61,000 - 80,000</td>
<td>107 (16.7)</td>
<td>67 (18.4)</td>
<td>40 (14.5)</td>
</tr>
<tr>
<td>$ 81,000 - 100,000</td>
<td>71 (11.3)</td>
<td>30 (8.2)</td>
<td>41 (14.9)</td>
</tr>
<tr>
<td>$ 101,000 - 150,000</td>
<td>85 (13.4)</td>
<td>42 (11.5)</td>
<td>43 (15.6)</td>
</tr>
<tr>
<td>$ 151,000 or greater</td>
<td>57 (8.8)</td>
<td>28 (7.7)</td>
<td>29 (10.5)</td>
</tr>
<tr>
<td><strong>Marital status</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Single</td>
<td>323 (48.0)</td>
<td>157 (41.6)</td>
<td>166 (56.8)</td>
</tr>
<tr>
<td>Legally Married</td>
<td>199 (29.9)</td>
<td>113 (30)</td>
<td>86 (29.5)</td>
</tr>
<tr>
<td>Domestic Partnership</td>
<td>81 (12.4)</td>
<td>60 (15.9)</td>
<td>21 (7.2)</td>
</tr>
<tr>
<td>Separated</td>
<td>8 (1.2)</td>
<td>7 (1.9)</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td>Divorced</td>
<td>51 (7.4)</td>
<td>34 (9)</td>
<td>17 (5.8)</td>
</tr>
<tr>
<td>Widowed</td>
<td>7 (1.2)</td>
<td>6 (1.6)</td>
<td>1 (0.3)</td>
</tr>
<tr>
<td><strong>Length of current romantic relationship</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Less than one month</td>
<td>7 (1.8)</td>
<td>4 (1.5)</td>
<td>3 (2)</td>
</tr>
<tr>
<td>Less than 6 months, but more than 1 month</td>
<td>33 (7.6)</td>
<td>22 (8)</td>
<td>11 (7.2)</td>
</tr>
<tr>
<td>Less than one year, but more than 6 months</td>
<td>45 (10.4)</td>
<td>31 (11.3)</td>
<td>14 (9.2)</td>
</tr>
<tr>
<td>Less than five years, but more than one year</td>
<td>148 (34.6)</td>
<td>107 (38.9)</td>
<td>41 (26.8)</td>
</tr>
<tr>
<td>More than five years</td>
<td>195 (45.6)</td>
<td>111 (40.4)</td>
<td>84 (54.9)</td>
</tr>
<tr>
<td><strong>Recruitment site</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Facebook</td>
<td>92 (13.7)</td>
<td>66 (17.6)</td>
<td>26 (8.8)</td>
</tr>
<tr>
<td>Reddit</td>
<td>505 (75.2)</td>
<td>257 (68.4)</td>
<td>248 (84.4)</td>
</tr>
<tr>
<td>Craigslist</td>
<td>54 (8.2)</td>
<td>42 (11.2)</td>
<td>12 (4.1)</td>
</tr>
<tr>
<td>Other (other website or through a person)</td>
<td>19 (2.9)</td>
<td>11 (2.9)</td>
<td>8 (2.7)</td>
</tr>
</tbody>
</table>

Note. Total N for length of current romantic relationship is 428 as the construct only applies to individuals in a current relationship. Due to missing data, the sum of N for other constructs for the total sample varies between 639 and 671. Education is rated on a twelve-point scale from 1 (Never attended school) to 12 (Earned a doctoral degree) and the data was regrouped in this table for compact presentation of results.
**Descriptive analyses of the study variables**

Table 3 reports the relations between the study variables as well as the means and standard deviations of the study variables, all stratified by sex.

Women were significantly older and more educated than men, while men had higher income, were more likely to be single, had a higher annual household income, and were more likely to be recruited from Reddit as opposed to other websites than women.

Attachment scores did not vary by sex, with the exception of child attachment anxiety, whereby women \( M = 2.58, SD = 1.58 \) had higher scores than men \( M = 2.15, SD = 1.28 \); \( t(611.79) = 3.78, p < 0.001 \).

With the exception of one relation, attachment as assessed by the Jaccard was related to attachment as assessed by the ECR-RS for both sexes and effect sizes were large: \( r = 0.69 \) to \( 0.75 \). Thus, the ECR-RS appears to be a valid measure of child attachment.

There were also significant relations between the covariates and study variables. For example, among women, as age increased, so did romantic attachment avoidance. Men with higher levels of education reported poorer sleep quality.

Sleep scores ranged from 0 to 20, with a mean of 8.78 \( (SD = 3.69) \). Of the sample, 80.6 \% \( (n = 408) \) scored above 5 and 71.7 \% \( (n = 363) \) scored above 6, which means that most individuals experienced poor sleep quality in the month preceding the data collection.
Table 3. Correlations among Attachment and Sleep Quality (N = 671).

<table>
<thead>
<tr>
<th>Covariates</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
<th>10</th>
<th>11</th>
<th>12</th>
<th>13</th>
<th>M (SD)</th>
<th>N</th>
<th>ES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attachment Parental (Combined)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. Avoidance</td>
<td></td>
<td>0.68**</td>
<td>0.72**</td>
<td>0.20**</td>
<td>0.09</td>
<td>0.01</td>
<td>0.20**</td>
<td>-0.06</td>
<td>-0.12*</td>
<td>-0.02</td>
<td>-0.14**</td>
<td>0.03</td>
<td>-0.02</td>
<td>3.92 (1.53)</td>
<td>347</td>
<td>0.03</td>
</tr>
<tr>
<td>2. Anxiety</td>
<td>0.57**</td>
<td></td>
<td>0.69**</td>
<td>0.24**</td>
<td>0.18**</td>
<td>0.18**</td>
<td>0.28**</td>
<td>0.08</td>
<td>-0.24**</td>
<td>-0.14**</td>
<td>-0.16**</td>
<td>-0.05</td>
<td>-0.16**</td>
<td>2.58 (1.58)</td>
<td>347</td>
<td>0.30***</td>
</tr>
<tr>
<td>3. Jaccard Parental (Combined)</td>
<td>0.38</td>
<td>0.75**</td>
<td></td>
<td>0.32**</td>
<td>0.09</td>
<td>0.17**</td>
<td>0.19</td>
<td>0.18</td>
<td>-0.26</td>
<td>-0.21</td>
<td>-0.11</td>
<td>-0.20</td>
<td>-0.13</td>
<td>26.04 (9.01)</td>
<td>46</td>
<td>0.53*</td>
</tr>
<tr>
<td>Romantic Partner</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Avoidance</td>
<td>0.28**</td>
<td>0.23**</td>
<td>0.26*</td>
<td></td>
<td>0.45**</td>
<td>0.19**</td>
<td>0.32**</td>
<td>-0.02</td>
<td>-0.10</td>
<td>-0.18**</td>
<td>0.09</td>
<td>-0.15*</td>
<td>-0.23**</td>
<td>2.25 (1.39)</td>
<td>345</td>
<td>0.12</td>
</tr>
<tr>
<td>5. Anxiety</td>
<td>0.04</td>
<td>0.19**</td>
<td>-0.06</td>
<td>0.54**</td>
<td></td>
<td>0.16**</td>
<td>0.08</td>
<td>-0.07</td>
<td>-0.09</td>
<td>-0.16**</td>
<td>0.20**</td>
<td>-0.23**</td>
<td>-0.17**</td>
<td>3.04 (1.93)</td>
<td>345</td>
<td>0</td>
</tr>
<tr>
<td>Sleep quality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>6. Sleep</td>
<td>0.17*</td>
<td>0.22**</td>
<td>0.19</td>
<td>0.23**</td>
<td>0.22**</td>
<td></td>
<td>0.19**</td>
<td>0.06</td>
<td>-0.09</td>
<td>-0.06</td>
<td>-0.16**</td>
<td>0.00</td>
<td>-0.17**</td>
<td>8.96 (3.58)</td>
<td>299</td>
<td>0.12</td>
</tr>
<tr>
<td>Covariates</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Age</td>
<td>0.02</td>
<td>0.19**</td>
<td>0.48*</td>
<td>0.01</td>
<td>0.04</td>
<td>0.19**</td>
<td></td>
<td>0.12*</td>
<td>0.05</td>
<td>0.04</td>
<td>-0.42**</td>
<td>0.32**</td>
<td>-0.29**</td>
<td>32.93 (11.51)</td>
<td>377</td>
<td>0.15*</td>
</tr>
<tr>
<td>8. Ethnicity/Race</td>
<td>-0.15*</td>
<td>-0.16**</td>
<td>-0.19</td>
<td>-0.05</td>
<td>0.02</td>
<td>0.03</td>
<td>0.10</td>
<td></td>
<td>0.06</td>
<td>0.05</td>
<td>-0.12*</td>
<td>-0.02</td>
<td>0.06</td>
<td>0.80 (0.40)</td>
<td>375</td>
<td>0.02</td>
</tr>
<tr>
<td>9. Education</td>
<td>-0.09</td>
<td>-0.07</td>
<td>-0.23</td>
<td>-0.10</td>
<td>-0.10</td>
<td>-0.11</td>
<td>0.20**</td>
<td>0.07</td>
<td></td>
<td>0.34**</td>
<td>-0.01</td>
<td>0.11</td>
<td>0.18**</td>
<td>8.66 (1.78)</td>
<td>363</td>
<td>0.26***</td>
</tr>
<tr>
<td>10. Income</td>
<td>-0.08</td>
<td>-0.08</td>
<td>-0.02</td>
<td>-0.16*</td>
<td>-0.15*</td>
<td>-0.16*</td>
<td>0.15*</td>
<td>-0.04</td>
<td>0.26**</td>
<td></td>
<td>-0.12*</td>
<td>0.23**</td>
<td>0.20**</td>
<td>4.40 (1.97)</td>
<td>364</td>
<td>0.25**</td>
</tr>
<tr>
<td>11. Marital status</td>
<td>0.08</td>
<td>-0.01</td>
<td>-0.17</td>
<td>0.31**</td>
<td>0.28**</td>
<td>-0.06</td>
<td>-0.50**</td>
<td>-0.18**</td>
<td>-0.16**</td>
<td>-0.15*</td>
<td></td>
<td>-0.46**</td>
<td>0.09</td>
<td>0.41 (0.49)</td>
<td>375</td>
<td>0.32***</td>
</tr>
<tr>
<td>12. Length of current romantic relationship</td>
<td>-0.12</td>
<td>-0.05</td>
<td>0.11</td>
<td>-0.20*</td>
<td>-0.20*</td>
<td>-0.09</td>
<td>0.34**</td>
<td>0.05</td>
<td>0.16</td>
<td>0.17*</td>
<td>-0.50**</td>
<td></td>
<td>0.03</td>
<td>4.09 (0.98)</td>
<td>275</td>
<td>0.16</td>
</tr>
<tr>
<td>13. Recruitment site</td>
<td>0.04</td>
<td>-0.10</td>
<td>-0.21</td>
<td>-0.02</td>
<td>-0.06</td>
<td>-0.01</td>
<td>-0.38**</td>
<td>0.05</td>
<td>0.09</td>
<td>0.09</td>
<td>0.10</td>
<td>-0.11</td>
<td></td>
<td>0.68 (0.47)</td>
<td>376</td>
<td>0.38***</td>
</tr>
</tbody>
</table>

Note. ES = effect size (Cohen’s d) indicates the size of the mean differences on all variables between men (1) and women (0). Correlations above the bolded diagonal are for women and those below the diagonal are for men. Parental attachment variables combine scores of avoidance and anxiety in relation to both mother and father. Attachment is coded from 1 (Strongly Disagree) to 7 (Strongly Agree) and higher scores indicate greater levels of attachment anxiety or avoidance, with the exception of the Jaccard attachment which is coded from 1 (Strongly Agree) to 5 (Strongly Disagree) with higher scores indicating higher attachment insecurity. Sleep scores range from 0 to 20 and higher scores represent poorer sleep. The coding for covariates is: for Ethnicity/Race: 0 = Non-White, 1 = White; Marital status: 1 = Single, 0 = Other; Recruitment site: 1 = Reddit, 0 = Other. Education, Income, and Length of current romantic relationship were examined as is, and scale rankings are shown in Table 1. *p < .05, **p < .01, ***p < .001
Hypothesis 1. Romantic attachment positively mediating the relations between child attachment and sleep quality.

The hypothesis that adult romantic attachment mediates the relations between child attachment to parents and poor sleep quality was tested after adjusting for covariates. The findings are diagrammed in Figures 4 and 6 for the women and Figures 5 and 7 for men.

For the women (Figure 4a), child avoidant attachment was not significantly related to sleep quality. Thus, there was no relation to mediate. Nevertheless, indirect effects of child avoidant attachment on sleep quality by means of romantic attachment were investigated (Figure 4B). The data indicated that increasing child avoidant attachment was related to poorer sleep quality by mean of increasing anxious romantic attachment ($\beta = 0.05$, $p < 0.05$, 95% Confidence Interval [CI]: 0.01 to 0.10).
Figure 4. *Romantic Attachment Avoidance and Anxiety as Mediators of the Relation between Childhood Avoidant Attachment and Sleep Quality among Women (N = 299).*

A) Direct path

B) Indirect path

*Note.* Standardized regression weights ($\beta$) are reported. Figure 4A is the direct path of child attachment avoidance on sleep quality independent of romantic attachment, adjusting for the covariates. Figure 4B shows the indirect effect models adjusting for the covariates. The proportion of variance explained by child attachment avoidance, romantic attachment avoidance, and romantic attachment anxiety is $R^2 = .23$, $F(3, 295) = 3.20, p < 0.05$.

- The direct effect of child attachment avoidance on sleep quality after adjusting for romantic attachment and covariates.
- The indirect effect of child attachment avoidance on sleep quality by means of romantic attachment avoidance ($0.20 \times 0.22$).
- The indirect effect of child attachment avoidance on sleep quality by means of romantic attachment anxiety ($0.15 \times 0.35$).

Analyses in Figures 4A and 4B were adjusted for age, ethnicity/race, education, income, marital status, length of current romantic relationship, and recruitment site.

* $p < 0.05$, **$p < 0.01$**
Among men (Figure 5A), child avoidant attachment was significantly related to poor sleep quality ($\beta = 0.56, p < 0.01, 95\% \text{ CI: } 0.21 \text{ to } 0.9$). There was no mediation as anxious and avoidant romantic attachment were not significantly related to sleep quality and did not interact significantly with child avoidant attachment. The association between child avoidant attachment and sleep quality remained significant after examining indirect relations of child avoidant attachment on sleep quality through romantic attachment ($\beta = 0.47, p < 0.01, 95\% \text{ CI: } 0.11 \text{ to } 0.82$) (Figure 5B). Thus, for men, early attachment seems to retain a direct relation with sleep quality, and men who were avoidantly attached to their parents in childhood were more likely to demonstrate poor sleep quality in adulthood.
Figure 5. Romantic Attachment Avoidance and Anxiety as Mediators of the Relation between Childhood Avoidant Attachment and Sleep Quality among Men (N = 212).

A) Direct path

Childhood Attachment Avoidance → 0.56** → Sleep Quality

B) Indirect path

Childhood Attachment Avoidance → 0.27*** → Romantic Partner Attachment Avoidance → 0.08 \(^b\) → Sleep Quality

Childhood Attachment Avoidance → 0.47** → Romantic Partner Attachment Anxiety → 0.01 \(^c\) → Sleep Quality

Note. Standardized regression weights (β) are reported.
Figure 5A is the direct path of child attachment avoidance on sleep quality independent of romantic attachment, adjusting for the covariates.
Figure 5B shows the indirect effect models adjusting for the covariates. The proportion of variance explained by child attachment avoidance, romantic attachment avoidance, and romantic attachment anxiety is R\(^2\) = .59, F (3, 208) = 7.18, p < 0.001.
\(^a\) The direct effect of child attachment avoidance on sleep quality after adjusting for romantic attachment and covariates.
\(^b\) The indirect effect of child attachment avoidance on sleep quality by means of romantic attachment avoidance (0.27 x 0.28).
\(^c\) The indirect effect of child attachment avoidance on sleep quality by means of romantic attachment anxiety (0.05 x 0.25).
Analyses in Figures 5A and 5B were adjusted for age, ethnicity/race, education, income, marital status, length of current romantic relationship, and recruitment site.

** p < 0.01, *** p < 0.001
For women (Figure 6A), the relation between child attachment anxiety and sleep quality, controlling for the covariates, was significant ($\beta = 0.33$, $p < 0.01$, 95 % CI: 0.09 to 0.56). Although romantic attachment anxiety was not significantly linked to sleep quality, mediation was established by the significant interaction of romantic attachment anxiety with child attachment anxiety ($\beta = 0.31$, $p < 0.05$, 95 % CI: 0.07 to 2.19). This means that increases in child attachment quality are linked with worsened sleep quality via romantic attachment anxiety depending on levels (low versus high) of romantic attachment anxiety. In order to understand for which groups of individuals the mediation is present, indirect relations were examined for individuals high in romantic attachment anxiety (defined by being at least one standard deviation above the mean) and those low in romantic attachment anxiety (defined by being at least one standard deviation below the mean). The data indicated that child attachment anxiety was related to sleep quality by means of romantic attachment anxiety when individuals report high levels of romantic attachment anxiety ($\beta = 0.43$, $p < 0.05$, 95 % CI: 0.06 to 1.08). The relation between child anxious attachment and sleep quality by means of romantic attachment anxiety was not significant for individuals reporting lower levels of romantic anxious attachment.

The mediation via romantic avoidant attachment was not supported as it was not related significantly to sleep quality and it did not interact significantly with child attachment anxiety.

Therefore, child attachment anxiety appears to be linked to sleep quality through its relation with high romantic attachment anxiety. However, even with the evidence of a mediation through high romantic attachment anxiety, the direct relation between child attachment anxiety and poor sleep quality was significant as well ($\beta = 0.25$, $p < 0.05$, 95 % CI: 0.01 to 0.5), suggesting that it is related to sleep quality directly as well as indirectly (Figure 6B).
Figure 6. Romantic Attachment Avoidance and Anxiety as Mediators of the Relation between Childhood Attachment Anxiety and Sleep Quality among Women (N = 299).

A) Direct path

B) Indirect path

Note. Standardized regression weights ($\beta$) are reported. Figure 6A is the direct path of child attachment anxiety on sleep quality independent of romantic attachment, adjusting for the covariates. Figure 6B shows the indirect effect models adjusting for the covariates. The proportion of variance explained by child attachment anxiety, romantic attachment avoidance, and romantic attachment anxiety is $R^2 = .15$, $F(3, 295) = 4.64$, $p < 0.01$.

$^a$ The direct effect of child attachment anxiety on sleep quality after adjusting for romantic attachment and covariates.

$^b$ The indirect effect of child attachment anxiety on sleep quality by means of romantic attachment avoidance ($0.21 \times 0.16$).

$^c$ The indirect effect of child attachment anxiety on sleep quality by means of romantic attachment anxiety ($0.23 \times 0.18$).

Analyses in Figures 6A and 6B were adjusted for age, ethnicity/race, education, income, marital status, length of current romantic relationship, and recruitment site.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$
In men (Figure 7A), child attachment anxiety was positively associated with sleep quality ($\beta = 0.48$, $p < 0.05$, 95% CI: 0.14 to 0.81), but this relation became nonsignificant when romantic attachment was introduced. Romantic attachment avoidance was significantly associated with sleep quality ($\beta = 0.41$, $p < 0.05$, 95% CI: 0.01 to 0.8), while romantic attachment anxiety was not and did not interact significantly with child attachment anxiety. Therefore, romantic attachment avoidance helps explain how child attachment anxiety and sleep quality are related, such that individuals which high levels of attachment anxiety toward their parents were more likely to have higher levels of romantic attachment avoidance, and, through high levels of romantic attachment avoidance, more likely to indicate poor sleep quality (Figure 7B).
Figure 7. Romantic Attachment Avoidance and Anxiety as Mediators of the Relation between Childhood Attachment Anxiety and Sleep Quality among Men (N = 212).

A) Direct path

B) Indirect path

Note. Standardized regression weights ($\beta$) are reported. Figure 7A is the direct path of child attachment anxiety on sleep quality independent of romantic attachment, adjusting for the covariates. Figure 7B shows the indirect effect models adjusting for the covariates. The proportion of variance explained by child attachment anxiety, romantic attachment avoidance, and romantic attachment anxiety is $R^2 = .18, F (3, 208) = 5.87, p < 0.001$.

- $^a$ The direct effect of child attachment anxiety on sleep quality after adjusting for romantic attachment and covariates.
- $^b$ The indirect effect of child attachment anxiety on sleep quality by means of romantic attachment avoidance ($0.2 \times 0.41$).
- $^c$ The indirect effect of child attachment anxiety on sleep quality by means of romantic attachment anxiety ($0.26 \times 0.19$).

Analyses in Figures 7A and 7B were adjusted for age, ethnicity/race, education, income, marital status, length of current romantic relationship, and recruitment site.

* $p < 0.05$, ** $p < 0.01$
Hypothesis 2. Relations between Romantic Attachment and Poor Sleep Quality.

The relations between romantic attachment and sleep quality were tested with a model involving sleep quality as a function of romantic attachment anxiety, avoidance, and the interaction of anxiety and avoidance. The model was significant for women ($R^2 = .13$, $F(4,295) = 5.78, p < .01$) as the predictor variables, taken together, were significantly associated with individual differences in poor sleep quality (Table 4). Specifically, romantic attachment anxiety was significantly linked to poor sleep quality, while romantic attachment avoidance and the interaction of avoidance and anxiety were not.

Table 4. Relations between Romantic Attachment and Sleep Quality among Women ($N = 299$).

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SEB</th>
<th>β</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP Avoidance</td>
<td>0.22</td>
<td>0.16</td>
<td>0.08</td>
</tr>
<tr>
<td>RP Anxiety</td>
<td>0.21</td>
<td>0.11</td>
<td>0.11*</td>
</tr>
<tr>
<td>RP Avoidance x RP Anxiety</td>
<td>0.07</td>
<td>0.08</td>
<td>0.05</td>
</tr>
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</table>

Set $sR^2$ for RP avoidance, anxiety, and their interactions = 0.04**

$R^2 = 0.13$*

Note. RP = Romantic partner. SEB = Standard error of the regression weight. Main effects for attachment avoidance and anxiety to romantic partner were introduced before the product terms in the regression model, with each main effect centered about its mean before the product term was computed. The proportion of variance explained uniquely by romantic partner attachment avoidance and anxiety and their interaction (set semi-partial $R^2$, $sR^2$) is reported. The analysis was adjusted for age, ethnicity/race, education, income, marital status, length of current romantic relationship, and recruitment site.

*p < .05, ** $p < .01$
Among men (Table 5), the model was also significant ($R^2 = .27, F (4, 208) = 7.2, p < .01$). Romantic attachment avoidance was significantly related to poor sleep quality, while anxiety was not. Moreover, the interaction of anxiety and avoidance appeared to offer little additional predictive power beyond that contributed by romantic attachment avoidance.

Table 5. Relations between Romantic Attachment and Sleep Quality among Men (N = 212).

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>SEB</th>
<th>ß</th>
</tr>
</thead>
<tbody>
<tr>
<td>RP Avoidance</td>
<td>0.45</td>
<td>0.20</td>
<td>0.15*</td>
</tr>
<tr>
<td>RP Anxiety</td>
<td>0.20</td>
<td>0.14</td>
<td>0.10</td>
</tr>
<tr>
<td>RP Avoidance x RP Anxiety</td>
<td>0.13</td>
<td>0.09</td>
<td>0.10</td>
</tr>
</tbody>
</table>

Set $sR^2$ for RP avoidance, anxiety, and their interactions = 0.08**

$R^2 = 0.27**$

Note. RP = Romantic partner. SEB = Standard error of the regression weight. Main effects for attachment avoidance and anxiety to romantic partner were introduced before the product terms in the regression model, with each main effect centered about its mean before the product term was computed. The proportion of variance explained uniquely by romantic partner attachment avoidance and anxiety and their interaction (set semi-partial $R^2$, $sR^2$) is reported. The analysis was adjusted for age, ethnicity/race, education, income, marital status, length of current romantic relationship, and recruitment site.

*p < .05, ** p < .01

Finally, four sets of logistic regressions were conducted to examine the link between romantic attachment and sleep, comparing good and poor sleepers using cutoffs of 5 and 6. A power analysis showed adequate power (> 0.80) to detect small effect sizes of odd ratios 1.39 and 1.45 for women and men, respectively. The analyses generated similar findings to those of the linear regressions just discussed.
Therefore, hypothesis 2 was not supported as no specific attachment style was associated with poor sleep quality. For women, romantic attachment anxiety was positively associated with poor sleep quality, whereas for men, romantic attachment avoidance was positively associated with poor sleep quality.
DISCUSSION

Sleep Quality

The sample’s sleep quality mean of 8.79 is higher than those of healthy patients ($M = 2.7$) and ranks in between the mean of patients with excessive somnolence ($M = 6.5$) and that of individuals with difficulties initiating or maintaining sleep ($M = 10.4$) but not to that of depressed patients, which was higher ($M = 11.1$) (Buysse, Reynolds III, Monk, Berman, & Kupfer, 1989). Given the large sample size (and therefore, power) in this study, and the privacy specific to online surveys leading to a reduced chance of social desirability bias, it is possible that the poor sleep quality that participants reported indicate a higher prevalence of sleep disturbances in the general population than previously estimated. At the same time, the online nature of the recruitment meant that only those using technology and active on the internet participated, and a study by Lavender (2005) using a sample with a similar mean age to this current sample’s showed that electronic media use was negatively correlated with sleep quality. There were no sex differences in sleep quality, a finding at odds with the sleep literature (Akerstedt, Fredlund, Gillberg, & Jansson, 2002; Carmichael & Reis, 2005; Djaza et al., 2005).

Hypothesis 1. Romantic attachment positively mediating the relations between child attachment and sleep quality.

Among women, increasing child avoidant attachment was related to poor sleep quality by means of increasing anxious romantic attachment, without a direct relation between child avoidant attachment and sleep quality indicating that the proposed model is incomplete and additional constructs not hypothesized in this study are related to sleep quality and may moderate the relation between child attachment avoidance and sleep quality in women. For men, there were no significant indirect relations via romantic attachment anxiety and avoidance, yet child attachment avoidance was significantly associated with sleep quality suggesting the importance
of child attachment avoidance in relation to sleep quality in men. For all participants, whether women or men, child attachment avoidance and romantic attachment avoidance were significantly correlated with a small to medium effect size ($r = 0.20$ for women, $r = 0.27$ for men), demonstrating the modest stability of attachment over time.

In the second model where the independent variable was child attachment anxiety, child attachment anxiety was related to sleep quality directly and indirectly among women, but for men, child anxiety was associated with sleep quality indirectly only. For women, romantic attachment anxiety was found to be a mediator of the relation between attachment anxiety to parents and sleep quality for women when they indicated high levels of romantic attachment anxiety. It is interesting to note that for women with low levels of anxious romantic attachment, romantic attachment anxiety was not a mediator and therefore, poor sleep quality was linked directly to child attachment anxiety only. This finding reflect the nuances in the relations between attachment and sleep quality.

For men, the path via romantic attachment avoidance was significant. These results show that child attachment anxiety is linked to sleep quality through different mechanisms depending on sex. It is interesting to note that in this model, child attachment anxiety and romantic attachment anxiety were significantly correlated for both women ($r = 0.23$) and men ($r = 0.26$), but with a small to medium effect size, indicating modest continuity in attachment.

**Hypothesis 2. Relations between Romantic Attachment and Sleep Quality.**

Results of the second hypothesis indicate that for women, sleep quality outcome may be driven by the anxiety dimension of romantic attachment, whereas for men, romantic attachment avoidance was associated with sleep quality. In both cases, increased levels of anxiety and avoidance were linked to poorer sleep. This confirmed connection between attachment
dimensions and sleep is not surprising considering that: a) the neurobehavioral systems involved in the regulation of sleep overlap with, and are closely linked to, neural systems involved in the regulation of affect and attention, that, in turn, are part of the attachment system and b) the regulation of emotions and arousal influences sleep quality. In other words, the findings confirm the idea that relationships, especially attachment relationships, can regulate sleep-wake states.

Using Bartholomew’s (1990) four-category model of attachment, women who were fearful or preoccupied were more likely to have poor sleep than those who were dismissing or secure; men who were dismissing or fearful were more likely to have poor sleep than those who were secure or preoccupied. These results are consistent with others showing that security is associated with good sleep quality (Escolas, Hildebrandt, Maiers, Baker, & Mason, 2013; Scharfe & Eldredge, 2001). Moreover, in the study conducted by Scharfe and Eldredge (2001), which involved a majority of young women, higher scores on fearful and preoccupied attachment styles (both being high on attachment anxiety) were associated with poor subjective sleep quality, results matching the current findings.

Two studies investigating the link between romantic attachment and sleep quality among women have found that, in addition to attachment anxiety, avoidance was also associated with poor sleep (Hsiao et al., 2013; Maunder, Hunter, & Lancee, 2011). However, the sample in the study conducted by Hsiao et al. was breast cancer survivors that had chronic hyperarousal and increased cortisol levels, which were not controlled for in the analyses. Maunder, Hunter, and Lancee’s study involved a sample with a smaller age range (25-63) than the current study, thus older participants (Median = 45), and they did not adjust for age in statistical analyses. Based on the correlations generated in this study, romantic partner avoidance increases as women grow older, ($r = 0.32$, $p < 0.01$), which may have accounted for the results’ discrepancy. In addition,
attachment avoidance and anxiety were analyzed separately, whereas in this study, when the effects of avoidance were considered, anxiety was controlled for, as suggested by Fraley and his colleagues (Fraley, Heffernan, Vicary, & Brumbaugh, 2011) when discussing the moderate to high correlation between the dimensions. Furthermore, when examining sleep architecture in a sample consisting predominantly of women, attachment anxiety, but not avoidance, was linked to the Alpha-EGG anomaly, an abnormal sleep pattern occurring in light sleep (Sloan, Maunder, Hunter, & Moldofsky, 2007). Another study of 107 clinically depressed women showed that high attachment anxiety was related to lower percentages of stage 3-4 deep sleep (Troxel, Cyranowski, Hall, Frank, & Buysse, 2007). This suggests differential impact of attachment dimensions on physiological indices of sleep quality.

There is no empirical research examining subjective sleep quality as a function of romantic attachment in men only, but one study involved 49 military veterans, with 85% of the sample being male. Although attachment avoidance and anxiety were associated with different sleep architecture anomalies which were advantageous for avoidance and disadvantageous for anxiety, neither were linked to subjective sleep quality (Troxel & Germain, 2011). Troxel attributed this finding to overall high rates of sleep disturbances in the veteran population, which meant that there was insufficient variability in sleep quality, continuity, and duration, to observe statistically significant relations with attachment variables (i.e. a ceiling effect). This explanation applies to the current sample, as individuals reported, on average, sleep quality which was considerably above the accepted cut-offs (5 and 6) distinguishing poor and good sleep quality.

**Sex differences**

The sex differences found when examining the relations between attachment dimensions and sleep quality can be explained once one considers the differences in affect modulation
between women and men. Men and women both use similar emotion regulation strategies (e.g. rumination, problem-solving, alcohol use), yet emerging research describes how men engage in these strategies more automatically and with less executive control (Nolen-Hoeksema, 2012). Women are more emotionally reactive to stressful events (such as separation) than men because they appraise these events as more stressful (Ge, Conger, & Elder, 2011). Women also report greater affect intensity and pay more attention to their emotions than men do in their daily lives (Gohm, 2003). Thus, compared with anxious men, women with high levels of romantic attachment anxiety are likely to experience poorer sleep because it is harder for them to manage emotions related to attachment situations generated during their day or prior to sleep. Men and women with high levels of attachment avoidance are likely to have the same emotional experiences, but men who are high in avoidance (fearful or dismissing) manage their emotions less consciously (e.g. they attend to their emotions less), which is efficient and effective in reducing arousal, leading to falling asleep, and sleeping more deeply, but may impact dream content, physiological abnormalities of sleep, and various elements of poor sleep quality, such as duration, restlessness, or physical pain. One finding supporting this idea is that dismissing people, compared to secure ones, reacted to anger-eliciting events with lower levels of self-reported anger but higher levels of physiological arousal and lack of awareness of this arousal (Mikulincer, 1998). For fearful individuals, the attachment system is likely to remain activated too due to competing (hyperactivating) approach and (deactivating) avoidance strategies and fearful individuals were found to lack the regulatory capacities to disengage from their attachment system (Fraley & Shaver, 1997).

An important distinction with implications for the conceptualization of sleep of men high in attachment avoidance is whether avoidance is the result of deliberate attempts to mask one’s
distress or a “true” deactivation of covert distress. Although both of these accounts lead to the same predictions concerning behavioral outcomes, they diverge considerably in the predictions they make regarding the cognitive and emotional mechanisms mediating the regulation of attachment behavior. Fraley and Shaver (1997) conducted two studies to distinguish between these competing explanations and found that unlike the childhood form of avoidance, which includes increased covert vigilance to the attachment figure's whereabouts, the use of defensive strategies by dismissing adults actually seemed to have reduced the accessibility of loss-related thoughts and to suppress the latent activation of their attachment system, whereas those of fearful adults did not. No comparable study has been conducted on sleep quality, but Troxel and Germain’s (2011) research demonstrated a “beneficial” sleep architecture anomaly for men high in avoidance levels, suggesting that such individuals have a deeper sleep and thus may be “protected” because of their tendency to use deactivating strategies.

**Implications for Research**

Because this was the first known study to examine the contributions of child and romantic attachment to sleep quality, further studies are needed to confirm the current findings.

In this study, attachment to mother and father were grouped into a combined parental variable. Because maternal and paternal attachment may differ for the individual, it is worthwhile to examine the mediational models by each parental attachment relationship. These analyses were conducted and with the exception of minor differences (e.g. the relation between maternal attachment avoidance and romantic partner anxiety was not significant), the findings were similar to the ones for the combined parental variable.
Moreover, the different findings for both hypotheses revealed differences by sex, and future research should consider potential factors which account for the sex differences in sleep quality (e.g. ways men and women regulate affect).

To further investigate the association of romantic attachment avoidance and poor sleep quality in men, it would be valuable to examine the link between varied components of poor sleep, including dream content, pain, sleep duration, daytime dysfunction, restlessness, and attachment-related cognitions, emotions, and behaviors prior to sleep, possibly measured via a sleep diary. The components of sleep can be measured via the PSQI and/or objective assessment tools such as wrist actigraphy.

Among women, child attachment avoidance had an indirect effect on sleep quality via romantic attachment anxiety, yet the tested model appeared to be incomplete, and therefore further constructs, such as personality organization, should be integrated in this model in the future to reflect this relation in a more complete way.

**Implications for Treatment**

Based on the high levels of poor sleep quality reported in this study, sleep problems in the general population appear to be more prevalent than we think. It is important for clinicians, whether primary care physicians, neurologists, psychiatrists, or clinical psychologists, to assess and monitor sleep difficulties in their patients. Unfortunately, education in sleep issues is not a part of most training programs, which is surprising given the disrupted sleep epidemic in the country. For instance, a survey of 215 residency programs in pediatric medicine in the United States revealed that the median hours of instruction in sleep and sleep disorders was 0 hours (Mindell, Moline, Zendell, Brown, & Fry, 1994).
When sleep dysfunction is assessed, attachment dimensions should be considered as being linked to poor sleep quality. Short self-report questionnaires like the one used in this study could provide valuable information. For men, child attachment avoidance related to sleep quality and romantic attachment avoidance explained the relation between child attachment anxiety and sleep. Therefore, it is important for professionals treating adult men with sleep disturbances to consider their attachment to their parents with an emphasis on past attachment avoidance to parents and current attachment anxiety to the romantic partner as they may be risk factors for the development and/or maintenance of sleep dysfunction. Women who complain of poor sleep quality should be assessed for both child and romantic attachment anxiety as they were both associated with sleep quality. Depending on the age of the patient, the attachment figure and contribution may vary, and thus the above relations should be considered within a developmental framework. Assessing attachment anxiety and avoidance in health practices could also help prevent the development of sleep difficulties in children and adults.

With respect to treatment, interventions for men and women, targeting both child and romantic attachment, appear appropriate to address sleep problems based on the results of the current study. In individual or group psychotherapy, clinicians and patients can address issues of attachment and sleep by attending to core views of self and others, considering sleep as a separation and waking as a reunion, and helping to increase one’s insight into their attachment in relation to their sleep quality, including duration and patterns while keeping in mind one’s history of sleep routines. Treatment of emotion dysregulation may also prove beneficial in attenuating the link between attachment insecurity and sleep quality.
**Limitations and strengths**

The conclusions of this study are limited by the study’s cross-sectional design and, although valuable associations were examined, one cannot interpret them as causal relations. With respect to temporal order, a mediating process must follow its cause (independent variable) and precede its effect (dependent variable). The cross-sectional study design does not allow testing the assumption that attachment is a stable variable that precedes sleep disturbance. Previous research indicates that attachment patterns are usually sufficiently stable over time to be considered trait phenomena (Mikulincer & Shaver, 2007), which therefore are likely to temporally precede the state phenomena of impaired sleep quality. However, prospective research is required to confirm the temporal sequence of relations found in this study.

Moreover, this study used a self-report measure to assess participants’ child attachment, with the risk that the responses are not based primarily on childhood experiences per se but on the way that individuals reflect on those attachments. There is a debate in the field about whether attachment style is best assessed through self-report versus interview procedures. The two methodologies are suggested to measure different aspects of attachment representations. It has been proposed that self-report measures assess the explicit content of the representations, which may or may not be accurate, while interview assessments tap the more implicit, presumably less conscious structure and process (Jacobvitz, Curran, & Moller, 2002). Similarly to the Adult Attachment Interview (AAI), which taps at adults’ mental representations of attachment by assessing recollections of childhood, the current mental representation of childhood attachment experiences in adults has been suggested to be related to multiple factors: the representation of attachment in the child, the parents’ interactive behavior to this child, and the occurrence of psychological disorders in adolescence and adulthood, as well as in the individuals’ children.
(Main, 1990; Minde & Benoit, 1991; van IJzendoorn, 1995). Therefore, this limitation of using a self-report measure to access child attachment is not different than those using clinical interviews, and longitudinal studies using the two methodologies to assess the same construct can help validate the use of self-reports to measure child attachment. Moreover, although people are often relatively accurate in remembering their earlier emotions (e.g., how they felt in response to a particular event), research also shows that systematic memory biases based on people's personality characteristics do occur. For instance, higher anxiety or neuroticism scores have been linked to overestimating the intensity of earlier negative moods (Feldman Barrett, 1997). Bernier and Dozier (2002, p.172) have concluded that “There is no doubt that what is tapped by self-reports of ‘attachment style’ is a very significant component of adult personality that plays a major role not only in close relationships but in a wide range of spheres of functioning.” Thus, incorporating personality dimensions into future studies using attachment and sleep self-reports is important. Still, the addition of the Jaccard measure in this study and the strong relations between the Jaccard and ECR-RS support the validity of the ECR-RS as an adequate measure of child attachment.

This study did not use measures of sleep architecture. The correlation between subjective sleep quality as measured by the PSQI and objective measures of sleep physiology (e.g. polysomnigraphy, actigraphy) has been inconsistent, and so replication using polysomnographic sleep measures would be valuable. Important contributions to our understanding of the scientific measurement of sleep have been achieved through polygraphic monitoring of the electroencephalogram (EEG). However, this measure of sleep analysis is expensive, time-consuming, and necessarily limited in its capacity to generate epidemiological type data for a large population of individuals. At the same time, 4 studies (McNamara, Pace-Schott, Johnson,
Harris, & Auerbach, 2011; Sloan, Maunder, Hunter, & Moldofsky, 2007; Troxel, Cyranowski, Hall, Frank, & Buysse, 2007; Troxel & Germain, 2011) support the link between attachment insecurity and sleep physiology, and so the correlations between attachment dimensions and impaired sleep quality are unlikely to be entirely due to a subjective reporting bias. Combining objective and subjective sleep measures can differentiate between various aspects of sleep that can distinctly affect or be affected by attachment style.

The stability of the current romantic relationship was measured in this study, but other sleep-related contextual variables were not incorporated, namely the quality of the romantic relationship at the time of data collection and whether those with partners slept in the same bed as their significant other. The latter has not been assessed in any study examining attachment and sleep, but studies looking at how sleeping arrangements impact sleep parameters showed a preference for co-sleeping and good sleep quality when co-sleeping (Troxel, Robles, Hall, & Buysse, 2007). The ritual of going to bed with a trusted other may serve as a powerful cue, allowing one to recover from the stresses of the day and reduce psychological and physiological arousal before falling asleep. The quality of the romantic relationship has been assessed in several studies showing that poor marital quality was associated with insomnia (Troxel, 2010; Troxel, Buysse, Hall, & Matthews, 2009) and that relationship support helped compliance with healthy behaviors and treatment targeting sleep disorders (Baron, Smith, Czajkowski, Gunn, & Jones, 2009; Cartwright, 2008).

The sample survey is an approach to understanding the relation between sleep and attachment in the community having many obvious advantages over the modern laboratory assessment. Indeed, community-based studies have the twin advantages of having larger samples (with consequent greater statistical power to detect differences and associations) and broader
representation (allowing generalizations of results to the community at large). Still, it is important to consider the results with caution as the sample was predominantly White and educated, and is not representative of the general population.

This study was the first of its kind in examining child and romantic attachment in the same model relating to sleep quality. Another strength is that it adjusted for many related constructs, including marital status, length of current romantic relationship, age, and race/ethnicity, which many studies on the same topic have not done. Finally, analyses were stratified by sex, which is important considering the differences in attachment and sleep in men and women.

**Conclusion**

In the research literature, attachment has been linked to a myriad of physical and mental health diseases and experiences. The lack of attention to the relation between attachment and sleep, is surprising, given the high prevalence of sleep difficulties and the contribution of sleep to mental health, morbidity, and mortality.

This cross-sectional study examined the ways that child and romantic attachment are associated with sleep quality in a sample of 671 heterosexual American adults recruited online. Taken together, findings show that increased levels of child and romantic attachment anxiety and avoidance are linked to poor sleep quality, but the nuances of these relations vary by sex and the specific combination of constructs examined. The results suggest that considering attachment as part of the broader framework of emotion regulation provides a window into individual differences in sleep quality, and that sleep-wake patterns can be incorporated in the repertoire of attachment behaviors. Following from these findings, implications for future research and
treatment were proposed.
References


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