Developmental Perspectives on Community Beliefs and Attitudes about Sleep

Chelsea Louise Dolan, BA (Psych. Hons)

School of Psychology, Faculty of Arts, Education and Human Development,

Victoria University

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Abstract

A number of studies have found that both dysfunctional beliefs and attitudes about sleep and sleep hygiene behaviours contribute to sleeping problems, particularly for those with insomnia. However, limited research has investigated beliefs and attitudes about sleep and sleep hygiene from a developmental perspective, within the community. This study was divided into two Phases. In Phase One, the aim was to develop a questionnaire assessing 'community' beliefs and attitudes about sleep, named the Views on Sleep Scale (VOSS). Another aim was to re-test the psychometric properties of a published scale assessing people's beliefs about sleep hygiene (Sleep Beliefs Scale, SBS, by Adan, Fabbri, Natale & Prat, 2006). Phase One of the study comprised of 209 adults from the general community, ranging in age from 18 to 86 (M = 41, SD = 15). The results found that both the VOSS and SBS had good internal reliability when examining the total score and individual items of the scales. In Phase Two, the aim was to test two age groups (18-25 years and 60+ years) about their beliefs and attitudes about sleep using the VOSS, SBS and the Sleep Plot (developed by Lack, 2007). Participants in Phase Two were younger adults (n=113; aged 18 to 25, M = 21.41 years) and older adults (n= 110; aged 60+ years, M = 72.13 years). Consistent with the hypothesis, the older adults held more dysfunctional beliefs and attitudes about sleep than the younger adults. In comparison, younger adults and males were found to hold more incorrect beliefs/less sleep hygiene knowledge than the older adults (respectively). An explanation was put forth, suggesting that older adults tend to be more concerned about their sleep and the consequences of poor sleep on daytime functioning. Therefore, it is suggested that the older adults are more concerned about practicing the correct sleep hygiene behaviours in comparison to younger adults. In addition, results found that both age groups realistically portrayed the sleep of a healthy 65 year old to have less deep sleep than a healthy 18 year old. Yet, both age group's perceived sleep to be unrealistically deep and uninterrupted throughout the night. This study suggests that dysfunctional beliefs and attitudes about sleep are more widespread across the community than just in those defined as poor sleepers. This study highlights important areas for education in the general community, such as sleep expectations, sleep beliefs, sleep hygiene behaviours, and the usual sleep-wake cycles across the night. It is proposed that changing widespread faulty perspectives may be helpful in the prevention and/or treatment of insomnia.

Doctor of Psychology Declaration

"I, Chelsea Dolan, declare that the Doctor of Psychology (Clinical Psychology) thesis entitled Developmental Perspectives on Community Beliefs and Attitudes about Sleep is no more than 40,000 words in length including quotes and exclusive of tables, figures, appendices, bibliography, references and footnotes. This thesis contains no material that has been submitted previously, in whole or in part, for the award of any other academic degree or diploma. Except where otherwise indicated, this thesis is my own work".

Signature: Date:

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Chapter 1: Literature Review

1.1 Introduction

Sleep problems are among the most frequent health complaints, insomnia being the most common (Adan et al, 2006). It would seem that some people in the community see increased sleep problems as an inevitable consequence of getting older. Yet most reported sleeping problems occur in two age groups: teenagers and the elderly (Bruck, 2006). Based on this, the current study has focused on these two age groups; younger and older adults. Clinical evidence suggests that a variety of dysfunctional beliefs, expectations, and attributions are instrumental in heightening emotional arousal and in exacerbating sleep disturbances (Morin, 1993; Morin, Blais & Savard, 2002). These dysfunctional beliefs may either turn what are normal changes in sleep patterns into a clinical problem or prolong what might otherwise have been a situational insomnia into a chronic problem (Morin & Gramling, 1989). The majority of research into the role of dysfunctional beliefs and attitudes about sleep has involved studying older adults who have insomnia and comparing them to older adults with good sleep. Such research has found that those with insomnia show more dysfunctional beliefs and attitudes about sleep than the good sleepers (Morin, Stone, Trinkle, Mercer & Remsberg, 1993; Carney, Edinger, Manber, Garson & Segal, 2007). However, other research has shown conflicting evidence whereby some dysfunctional beliefs and attitudes about sleep were unable to distinguish between those with insomnia and good sleepers (Voinescu, Coogan & Orasan, 2010; Ellis, Hampson & Cropley, 2007). To date, there have been few published studies that investigate dysfunctional beliefs and attitudes about sleep among the general community, to investigate the public's perceptions on sleep. Furthermore, there have been no published studies that compare these dysfunctional beliefs and attitudes about sleep from a developmental perspective (comparing different ages). Further, recent research shows that sleep hygiene practices are related to sleep quality (Brown, Buboltz & Soper, 2002; LeBourgeois, Giannotti, Cortesi, Wolfson & Harsh, 2005). Sleep hygiene practices are behaviours that either interfere or promote sleep (e.g., drinking coffee or alcohol before bed, napping during the day, and using the bed for other activities than sleep or intimacy). To date, no known published research has investigated developmental differences and perceptions about sleep hygiene. Furthermore, recent research suggests that the community's perception of a good

night's sleep is that of a deep and uninterrupted sleep (Lack, 2007). To date, no published research has investigated community perceptions of the course of a typical night's sleep from a developmental perspective. While dysfunctional beliefs and attitudes about sleep and sleep hygiene are known to impact on sleep, people's perspectives on a typical night's sleep is believed to impact sleep, thus the purpose of this research is to investigate these further as well as compare them from a developmental age perspective. The results of this research will be useful for public health initiatives targeting people's unhelpful beliefs and attitudes about sleep. Much research has investigated community beliefs and attitudes about a range of mental illnesses (Lauber, Carlos &Wulf, 2005; Schomerus, Matschinger & Angermeyer, 2006; Ward & Besson 2012) and concluded that these community beliefs are important to inform clinical practice and to educate the general public. The aim of this research is similar, in that the results will provide important areas for education in the general community on sleep beliefs.

The following literature review will examine research relevant to the issues of dysfunctional beliefs and attitudes about sleep (including sleep hygiene beliefs) in the general community, where possible with a focus on age related differences. This literature review will first review the research on insomnia and its treatment. It will discuss the: causes, classifications, and consequences of insomnia (and different types); some of the different theories of insomnia; and the most widely used and effective treatment of insomnia, namely Cognitive Behavioural Therapy (CBT). Additionally this literature review will discuss the impact of dysfunctional beliefs about sleep on sleep quality. It will look at the scales that have been developed to measure dysfunctional beliefs and attitudes about sleep, and review and discuss all the previous research on community attitudes and beliefs about sleep (including sleep hygiene). Next the research regarding the sleep of younger (including adolescents) and older adults will be presented. Differences in sleep as a function of gender will also be briefly discussed. Lastly, it will present information regarding the current study, outlining the rationale, aims and hypotheses.

The term dysfunction was put forth by Morin and colleagues (1993) to describe certain beliefs around sleep including: misconceptions about the cause of insomnia,

misattributions about the consequences of insomnia; unrealistic expectations about sleep; control and predictability of sleep; and mistaken beliefs about sleep promoting behaviours. Please note, when the current study refers to "dysfunctional" it is referring to this same term of dysfunctional beliefs and attitudes about sleep as described above.

1.2 Insomnia and its treatment

1.2.1 Causes and classifications of different types of insomnia

Sleeping difficulties can be affected by many different factors and is thus an individualised problem (Ambrogetti, 2000). Such factors that may affect a person's sleep include other mental health problems, pain, stress, health concerns, sleep environment, age, menopause and many more (Wilkerson, Boals & Taylor, 2012). Different people need different amounts of sleep and every person experiences difficulties sleeping at some time, however, insomnia differs from transient sleeping difficulties in its frequency and severity. Insomnia is defined (see below) as sleep problems characterised by difficulty falling asleep, frequent waking during the night, or waking up earlier than desired usually without feeling refreshed. At least 20% to 40% of all adults suffer insomnia at least intermittently, whereas 10% to 15% endure chronic, unrelenting sleep difficulty (Edinger et al, 2000). Although insomnia is more commonly reported in females than males, both genders show an increasing tendency for this type of sleep difficulty with aging (gender differences will be briefly described in more detail under Section 1.4).

Types of insomnia

Sleep disorders are associated with difficulty falling asleep, maintaining sleep and excessive sleepiness and are characterized by a disturbance in the amount, quality and timing of sleep (4th ed., text rev.; *DSM–IV–TR*; American Psychiatric Association, 2000). According to the DSM-IV-TR (2000 4th ed., text rev) there are six types of primary sleep disorders including: Primary hypersomnia, Primary insomnia, Narcolepsy, Breathing-related sleep disorder, Circadian rhythm sleep disorder, and Dyssomnia Not Otherwise Specified. For the purpose of this study the focus in the following review will be on insomnia. Insomnia is essentially difficulty falling asleep or maintaining sleep. In order to meet the DSM-IV diagnostic criteria for insomnia a person must be experiencing these difficulties for at least 1 month on three or more days

during the week. Similar to other disorders the difficulty falling asleep or maintaining sleep must be severe enough to impact the person's social, occupational or other areas of functioning. Many other disorders and/or medical conditions can impact one's sleep in which case insomnia may be diagnosed as secondary to another condition.

The International Classification of Sleep Disorders, Second Edition (ICSD-2, 2005) differs from the DSM-IV in its approach to defining insomnia. The ICSD-2 (2005, 2nd ed) subdivides insomnia into descriptive, etiologic categories including: Adjustment insomnia (acute insomnia), Psychophysiological insomnia, Paradoxical insomnia, Idiopathic insomnia, Insomnia due to mental disorder, Inadequate sleep hygiene, Behavioural insomnia of childhood, Insomnia due to drug or substance, Insomnia due to medical condition, Insomnia not due to substance or known physiological conditions, unspecified, Nonorganic insomnia NOS, Physiological (organic) insomnia, unspecified. The ICSD is more specific in the onset and causes of insomnia than the DSM-IV. The ICSD expresses that the person must display poor sleep despite adequate opportunity and circumstances to sleep. Similar to the DSM-IV, the ICSD specifies whether insomnia is present due to a psychological disorder or medical condition and has an impact on the person's functioning.

Classification of insomnia

Insomnia can be classified as transient, acute, or chronic (Szuba, Kloss, & Dinges, 2003). Transient insomnia is difficulty falling asleep or maintaining sleep that lasts for less than a week. This type of insomnia can be due to factors such as changes in the sleep cycle or environment, other mental disorders (such as depression) or by stress. Acute insomnia is the difficulty falling asleep or maintaining sleep that occurs for less than a month but is still severe enough in frequency and impact on a person's functioning. Chronic insomnia is the difficulty falling asleep or maintaining sleep that lasts for longer than a month, usually occurring three to seven nights a week, which causes a significant impact on the persons functioning. The person may experience the following difficulties: initiating sleep between three to seven nights a week; problems staying sleep and waking 3 or more times at night; taking a long time to get back to sleep after awakening (30 or more minutes awake); and/or waking too early in the morning (30 minutes or more early).

Impact of insomnia (physically and psychologically)

Insomnia can have a great impact on a person's life, if untreated insomnia can lead to many negative consequences (Wilkerson et al., 2012). As described earlier, insomnia (acute and chronic) affects functioning in many important areas of a person's life, including their social and occupational functioning. However it has also been found that insomnia may have an impact on a person's psychological well being and quality of life (Drake, Roehrs & Roth, 2003;Wilkerson et al., 2012). Insomnia has been found to be associated with fatigue and mood disturbances. If a person is sleep deprived this can increase their irritability, tension and feelings of helplessness which can result in a lowered or depressed mood. Studies have also shown that a person with insomnia is at higher risk of developing a major depressive disorder (Perlis et al., 2006; Ohayon & Roth, 2003) as well as an anxiety disorder (Neckelmann, Mykletun, & Dahl, 2007; Taylor, Lichstein, Durrence, Riedel & Bush, 2003). In addition to this, insomnia may cause daytime fatigue which is associated with an increased risk of work related absenteeism, traffic and work site accidents, alcohol and/or drug abuse, and debilitating psychiatric disorders (Ohayon & Roth, 2003; Taylor et al. 2003).

The impact of insomnia on a person's long term physical health is largely unknown; however, it is associated with an increased risk of serious medical illness (Edinger et al., 2000; Mallon, Broman & Hetta, 2002). There is a large association between insomnia and somatic complaints including gastrointestinal problems, respiratory problems, headaches, and other aches and pain (Martikainena, et al, 2003). Morin and Espie (2003) reported that there is an association between sleep and health complaints but there is no causal relationship documented to date. Similarly, some studies suggest that chronic insomnia may result in diminished immune system functioning, however no causal relationship has been found. In controversial research, it has been suggested that people who sleep less may be more likely to gain weight, which can lead to obesity (Taheri, Lin, Austin, Young & Mignot, 2004). Research has shown that sleep deprivation increases one's appetite through hormonal changes, specifically more of the appetite-increasing hormone ghrelin is produced. Sleep deprivation arising from poor sleep is also more likely to affect a person's coordination and motor functioning, and their reaction time may be delayed (Wilkerson et al., 2012; Williamson & Feyer, 2000).

Causes of insomnia

Insomnia can be caused by many different factors, however it is important to note that many of the factors described below do not independently cause insomnia, but rather they may contribute to its development. The causes and/or triggers of insomnia can include a number of different factors including situational factors, physical or psychological conditions, or primary sleep problems (Schutte-Rodin, Broch, Buysse, Dorsey & Sateia, 2008). Situational factors that may impact a person's sleep and lead to insomnia are changes in one's environment and lifestyle. Common events that may impact a person's sleep include shift work, stressful situations, travelling, and medications. Other factors that may also impact a person's sleep can include using stimulants or alcohol before bed as well as sleeping in bed with a partner who disrupts the person's sleep. Some people may have difficulty with their sleep due to psychological disorders or concerns (Ambrogetti, 2000; Hardy, 2008). The most common psychological problems that may lead to insomnia are stress, anxiety and depression (Drake et al., 2003). These disorders can affect a person's quality of sleep due to physical and mental hyper arousal and can be associated with either long term or acute insomnia. Many medical or physical problems can trigger insomnia and affect a person's sleep (Kales & Kales, 1984; Wilkerson et al., 2012). Some common medical conditions that may lead to insomnia are asthma, pain, heart disease, high blood pressure and hormonal changes in women. As described above there are many possible causes of insomnia and factors to take into account, however there are groups of people that have been identified as having a higher risk of developing insomnia (Schutte-Rodin et al., 2008; Roth & Roehrs, 2003). These groups of people include shift workers, older adults, people who frequently travel, women undergoing menopause, people who use alcohol or other substances, women who are pregnant, and adolescents or young adult students. These groups of people are at higher risk due to changes in hormones, aging or life style factors which impact their sleep and thus make them more susceptible to developing insomnia than others. Additionally, Morin and Gramling (1989) found that the nature of insomnia changes over the lifespan, where older adults with insomnia experience difficulties maintaining sleep whereas younger people have more difficulty initiating sleep. The differences in sleep across these two age groups, older and younger adults, will be briefly discussed in Section 1.4.

1.2.2 Some theories of insomnia

Many theories have been proposed to conceptualise insomnia. The underlying basis for insomnia has been attributed to physiological, cognitive and behavioural elements. Some theories better explain the maintenance of insomnia rather than how it originated. A range of coherent contributions have been made to the understanding and treatment of insomnia. While it is likely that many elements play a role in the onset and maintenance of insomnia there is increasing evidence in support of the role of cognitive models of insomnia (Tang & Harvey, 2004). Due to the volume of research on the models of insomnia only some of the theories proposed to conceptualise insomnia are briefly described below, including the theories concerned with *behavioural, arousal* and *cognitive* factors. These theories are focused on in the current section as they are most relevant to the hypotheses developed for this study. It is important to note that other theories and perspectives of insomnia have included physiological (Bonnet & Arand, 1997), cognitive behavioural (described in more detail in section 1.2.3) (Espie, 1991; Morin, 1993), chronobiological (Campbell, Murphy, van den Heuvel, Roberts, & Stauble, 1999), and biochemical (Doble, 1999; Haefely, 1990; Vogel, 1992).

Firstly, *behavioural* issues have been outlined in the role of insomnia by Bootzin (1972) and Spielman, Saskin, & Thorpy (1987). Bootzin's theory of conditioned insomnia notes that a person with insomnia begins to associate their bedroom with negative feelings and being awake rather than with sleep (Bootzin, 1972). A person just going into their bedroom may have frustrating feelings of not being able to sleep, a type of unconscious learning. Bootzin's theory is instrumental in behavioural treatment which is outlined below.

One of the first theories proposed to explain the development and maintenance of insomnia was developed by Spielman and colleagues (Spielman, Caruso & Glovinsky, 1987). Speilman's theory is also referred to as the 3-P model because it explains insomnia based on predisposing, perpetuating and persisting factors. This theory proposes that various predisposing factors are instrumental in the development of insomnia; these factors include a person's traits and familial associations (for example a person may be prone to being anxious and worry) (Basta, Chrousos, Vela-Bueno & Vgontzas, 2007). Also precipitating factors play a role in the development of insomnia

and these can include life stressors and events which may make the person vulnerable to periods of transient insomnia. Lastly it is proposed that chronic insomnia may then be developed and maintained by perpetuating factors such as maladaptive coping strategies (including poor sleep hygiene). Thus, according to Speilman's theory a person may be vulnerable to insomnia due to various traits, may experience transient insomnia due to life stressors, and as a result chronic insomnia may develop due to the person adopting poor habits and behaviours around sleep (Basta et al., 2007).

Secondly, the concept of *arousal* plays an important role in the explanation and understanding of insomnia and how it is maintained (Tang & Harvey, 2004). Hyper-arousal is experienced by a person even throughout the day and this continues at night (possibly hyper-vigilance) which leads the person to experience difficulty falling and staying asleep. Hyper-arousal is an increase in the activation of the autonomic nervous system. A person experiences sleep disturbances due to an increase in heart rate, metabolic rate, body temperature and many other changes in the body (Tang & Harvey, 2004). Hyper-arousal can simply be described as the person is in a fight-or-flight response whereby the brain detects some danger and is then on guard for any potential danger. There are different types of arousal that are conceived to contribute to insomnia such as physiological, emotional, cortical, and cognitive arousal (Drake, Richardson, Roehrs, Scofield & Roth, 2004).

The physiological arousal model of insomnia proposes that insomnia is due to physiologic or neurophysiologic hyper-arousal (Roth, 2007). In other words a person experiences difficulty sleeping due to factors such as an increased heart rate. Bonnet and Arand (1998) found in a 36 hour study that people with insomnia had an increased average heart rate in all stages of sleep when compared to healthy sleepers.

Similarly, research has proposed that emotional arousal, also referred to as emotion dysregulation, is crucial in the development of insomnia (Baglioni, Spiegelhalder, Lombardo & Riemann, 2009). When the personality traits of people with insomnia have been tested they found that those with insomnia were more likely to internalise problems (e.g., depression, worry) than externalise them (e.g., acting out, aggressive). Based on this, the theory of internalisation of conflicts was developed (Kales, Caldwell,

Preston, Healey & Kales, 1976). According to this theory, a person's predisposition to internalise problems leads to increased levels of emotional arousal. Once a person's emotional arousal is heightened this in turn creates physiological hyper-arousal and the person then has disruptions to their sleep (Baglioni et al., 2009).

The role of distorted perception of sleep in the maintenance of insomnia has received much more attention (Drake et al., 2004). This role has been increasingly recognised, as reflected in its incorporation into recent theoretical models of chronic insomnia. Perlis, Meric, Smith and Giles (2001) believe that cortical arousal plays a vital role in insomnia. Perlis and colleagues (2001) found that people with insomnia show higher-frequency electroencephalographic (EGG) activity during sleep, especially around sleep onset. They proposed that this results in a disruption of normal sleep (onset and maintenance) and may account for distorted perception.

Lastly, a *cognitive* (arousal) model of insomnia was developed by Harvey (2002) that proposes how insomnia is maintained. According to this model, people with insomnia experience negative thoughts and excessive worry during the pre-sleep period (Harvey, 2002; Morin, 1993). These excessive negative cognitions are based on not getting enough sleep and how sleep problems impact on their health and daytime functioning (Harvey, 2002). Increased arousal and emotional distress is then triggered by the person experiencing excessive worry and negative cognitions (Harvey, 2002). The person is now in an anxious state and the triggering of arousal activates the fight or flight response (i.e. experiences sleep-related threats such as getting enough sleep or functioning the next day). These threats are maintained by high anxiety as the person is more likely to perceive they got less sleep than they actually did and that any problems that arise the next day they attribute the cause to sleep. Finally, it is suggested that many additional factors then further contribute to the maintenance of this anxiety (Harvey, 2002). One may adopt maladaptive coping strategies such as staying in bed while awake and spending longer time in bed. Furthermore, safety behaviours are adopted to cope with the excessive cognitive activity (Harvey, 2002). This escalation in anxiety and sleep preoccupation contribute to the maintenance of insomnia as they are both unhelpful to optimal sleep. Ultimately this process may continue as increased arousal

and anxiety are states in which do impact on sleep onset and maintenance and their daytime functioning may be hindered (Harvey, 2002).

In summary, many theories have been proposed to explain the development, maintenance and treatment of insomnia. Only some of the theories put forth have been briefly covered in this section. These included theories of behavioural, arousal and cognitive factors. Behavioural theories mostly consist of those built on the proposal of Bootzin (1972) that insomnia is essentially conditioned due to unconscious learning. Also, one of the first theories of insomnia, named the 3-P model, explains insomnia based on predisposing, perpetuating and persisting factors (Spielman et al., 1987). Theories of hyper-arousal propose that insomnia is based on physiological, emotional, cortical and cognitive arousal. Essentially, proposing that insomnia is the result of the body experiencing a state of arousal (fight or flight response) that interferes with optimal sleep. The cognitive model of insomnia describes the way in which insomnia is maintained. Specifically, that distorted perception of sleep is what maintains insomnia (Harvey, 2002). There are many other theories of insomnia such as models of inadequate sleep drive, excessive arousal cycles that interferes with a person being able to fall asleep or stay asleep, and sleep interfering and interpreting process (Lundh & Broman, 2000). Other research postulates different cycles in the development of insomnia between different arousals states (for example between automatic, physical, cognitive, and emotional arousal) (Baglioni et al., 2009). However, there remains no consensus regarding the specific aetiological mechanisms of this disorder (Drake et al., 2003).

1.2.3 The role of behaviour and cognitions on sleep and their treatment

A large number of people who have insomnia take medication to sleep, however many people can become tolerant to the medication and after a period of time their sleep disturbances may return (Eddy & Walbroehl, 1999). Research has shown, however, that Cognitive Behavioural Therapy (CBT) is effective in treating insomnia (Okajima, Komada & Inoue, 2011; Verbeek, Konings, Aldenkamp & Declerck, 2006; Morin, Kowatch, Barry &Walton, 1993). CBT is effective in producing reductions in dysfunctional beliefs and attitudes about sleep, negative daytime symptoms, as well as vital improvements in sleep indicators (i.e. sleep onset latency, time awake after sleep

onset, total sleep time, sleep quality, and sleep efficiency). For total sleep time and sleep efficiency, the improvements with CBT are maintained at one year follow-up as well (and more so than hypnotic medication), making CBT intervention a viable early intervention for patients with insomnia (Okajima et al., 2011; Jansson & Linton, 2005). CBT typically contains two parts: cognitive and behavioural techniques for treating insomnia. The impact of both behaviours and cognitions on sleep is described below. Also described below is an overview of the typical treatment for both cognitive and behavioural techniques. Please note these are common techniques as treatment may vary for individuals.

The impact of cognitions on sleep

Clinical evidence suggests that a variety of faulty beliefs, expectations, and attributions are instrumental in heightening emotional arousal and in exacerbating sleep disturbances (Harvey, 2002; Morin, 1993; Morin et al., 2002). It is evident that dysfunctional beliefs and attitudes can impact both how people perceive sleep problems and their actual sleep patterns. Dysfunctional beliefs about sleep cover topics such as: napping, age and sleep, waking during the night, the consequences of poor sleep, insomnia effects and many more. It also may include the expectation that eight hours of sleep is essential to function adequately during the day. This sleep expectation can produce performance anxiety, especially when this standard is not met (Jansson & Linton, 2005; Harvey 2002). Such faulty beliefs may either turn what are normal changes in sleep patterns into a clinical problem or prolong what might otherwise have been a situational insomnia into a chronic problem. Thus faulty cognitive beliefs and attitudes about sleep can trigger arousal and feed into the insomnia problem (Espie, 1991). Evidence suggests that the content and affective valence of cognitions (beliefs, expectations, attributions), rather than excessive cognitive activity as such (intrusive thoughts, racing mind), is an important mediating factor of insomnia (Morin et al., 2002). Thoughts that are negative and sleep related (e.g., fear of the consequences of sleep loss) are associated with more severe sleep difficulties, as are causal attributions of insomnia that are external and unstable (Harvey, 2002; Morin et al., 2002). In summary, there are common misconceptions and expectations about sleep that can affect sleep, these include: unrealistic sleep expectations (e.g., I need to have 8 hours of sleep each night); misconceptions about insomnia causes (e.g., I have a chemical

imbalance causing my insomnia); amplifying the consequences of insomnia (e.g., I cannot do anything after a bad night's sleep); and performance anxiety after trying for so long to have a good night's sleep by controlling the sleep process (Morin & Espie, 2003).

Cognitive treatment of CBT

Due to the impact of thoughts and beliefs on sleep, this is of specific focus when treating sleeping problems. The goal is to challenge and restructure thoughts and beliefs that may keep one from falling or staying asleep (Morin et al., 1993; Carney & Edinger, 2006). This is based on the premise, described above, that often people have anxiety and worry around their sleep and distorted thinking and behaviours around sleep continue their difficulties. Challenging and restructuring negative thoughts and worries about sleep involves recognizing negative thoughts about sleep and replacing them with more realistic sleep promoting thoughts (Jansson & Linton, 2005). An example of a negative thought someone may hold is "I should be able to sleep all night like every other normal person", this person would be encouraged to challenge this thought and replace it with a more realistic thought such as, "It is normal to sometimes wake during the night and lots of people have nights they don't sleep as well".

The impact of behaviour on sleep

Sleep hygiene can be defined as behavioural practices that promote good sleep quality, adequate sleep duration and full daytime alertness (LeBourgeois et al., 2005). Sleep hygiene is not only important for those with a sleep disorder but also for everyone, as healthy lifestyle practices that promote good sleep may prevent sleep from turning into a problem (Morin & Espie, 2003). The literature is mixed as to the role of sleep hygiene in sleep problems. Poor sleep hygiene may not be a casual factor of insomnia, however sleep hygiene practices play a role in perpetuating insomnia (Harvey, 2000; Jefferson et al., 2005). It is important to note that sleep hygiene practices alone are unlikely to be sufficient in improving sleep problems rather are a part of a wider treatment plan. However, recent research (Roane, Dolan, Bramoweth, Rosenthal & Taylor, 2012) found that behavioural interventions (including sleep hygiene) reduce patient's unhelpful beliefs about sleep. This research demonstrates that sleep hygiene does play a vital role in the treatment of sleep problems. The main factors that are known to affect sleep

through their stimulation of the central nervous system (increase wakefulness or interrupt sleep) are caffeine, nicotine, alcohol, diet and exercise (Roane et al., 2012). Engaging in these activities around sleep time is likely to promote difficulty falling asleep or maintaining sleep (Harvey, 2000; Roane et al., 2012). Other sleep hygiene practices include avoiding late-afternoon naps and alcohol, tobacco, and caffeine before bedtime; following a bedtime routine; avoiding bedtime activities that are physiologically, cognitively, and emotionally activating; not using the bed for activities other than sleep or sex; sleeping in a comfortable, quiet, toxin-free environment; and maintaining a stable sleep schedule (Morin & Espie, 2003). Adequate sleep quality can be defined as going to bed easily at bedtime, transition effortlessly from wakefulness to sleep, maintaining undisturbed sleep, reinitiating sleep after nocturnal arousals and awakenings, and transition easily from sleep to wakefulness in the morning (Roane et al., 2012). For example, sleep hygiene in younger adults may be impacted by social pressures like afterschool sports, evening jobs, television, internet use, mobile phones, and homework (Gallasch & Gradisar, 2007). Any of these may delay bedtime on school nights, while caffeine, nicotine, and illicit drugs may also interfere with timely sleep onset. Other behavioural factors can impact on sleep and these will be described below when discussing treatment techniques.

Behavioural treatment of CBT

This involves looking at what one is doing either during the day or around their sleep that may be maintaining sleeping problems or potentially making them worse. Behavioural techniques help the client to change habits they may be engaging in that affect their sleep. Some techniques used may also include biofeedback as well as using a sleep diary. The most common behavioral treatment techniques used include sleep education, sleep hygiene guidelines, stimulus control, sleep restriction and relaxation. The following are described below:

Sleep Education is an important phase in the treatment of sleep problems (Edinger, Wohlgemuth, Radtke, Marsh & Quillian, 2001). In order to make changes to sleep, it is important that one understands the basics of sleep. For example, understanding sleep cycles, behaviours that impact on sleep quality and how beliefs and other factors affect sleep.

Sleep hygiene, as described above, involves changing lifestyle habits that affect sleep. It may involve maintaining a consistent sleep schedule and decreasing behaviours that are known to impact negatively on sleep, while increasing behaviours to increase sleep (for example, going to bed at the same time each night) (Hauri, 1991). Often working with a client around changing their habits that may be negatively impacting their sleep can significantly reduce symptoms of insomnia (Hauri, 1991; Edinger et al., 2001).

Stimulus control therapy is based on the principles of classical conditioning and is proposed to encourage seeing the bed as a cue for sleeping (Bootzin, Epstein & Wood, 1991; McCurry, Logsdon, Teri & Vitiello, 2007). It aims to increase behaviour when the stimulus is present and decrease the behaviour when the stimulus is absent. In terms of sleeping problems, it involves removing stimulus that resists sleep. For example, learning to only use the bed for sleep and sex, and a person may be encouraged to leave the bed when they are unable to sleep.

Sleep restriction (Spielman et al., 1987) is a technique designed to consolidate sleep. It is based on the premise that lying in bed when awake can become a habit that leads to poor sleep (Verbeek et al., 2006). Limiting and restricting the amount of time spent in bed to correspond with time spent asleep can assist in consolidating sleep (also aims to make you feel sleepier when you do go to bed).

Relaxation can also be used in order to help calm the mind and body. This is particularly useful for someone who finds it difficult to relax at night, especially when trying to sleep (Espie, 1991; Morin, Culbert, & Schwartz, 1994). Relaxation aims to help to relax the mind but also relieve tension in the body, making it easier for one to fall asleep and return back to sleep if they awaken during the night. A variety of relaxation techniques can be helpful that focus on relaxing the mind, body and controlled breathing, these may include: deep breathing, progressive muscle relaxation, meditation, visualization, yoga and more.

1.3 The measurement of dysfunctional beliefs and attitudes about sleep and sleep hygiene.

1.3.1 Questionnaires that measure sleep beliefs and attitudes and sleep hygiene

To date, there are a small amount of questionnaires that measure sleep beliefs and attitudes, which will be described below. The majority of the measures used in research about sleep are focused on the identification, severity and diagnosis of a possible sleep disorder and sleep quality (for example the Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman & Kupfer, 1989), The Epworth Sleepiness Scale (ESS; Johns, 1991), and the Sleep Dissatisfaction Questionnaire (SDQ; Douglass, Bornstein, Nino-Murcia et al., 1994). Often, sleep and associated problems are also measured by a person completing a sleep diary, clinical assessment and questionnaires measuring other linked problems to sleep disturbances (for example depression, anxiety and quality of life scales) (Morin & Espie, 2003). The questionnaires described below measure sleep related beliefs and attitudes and sleep hygiene practices. Please note that the questionnaires presented below include all those that have been identified as published based on searches of PsycINFO and Academic Search Premier Databases:

Dysfunctional Beliefs and Attitudes about Sleep Scale (DBAS)

The most widely used scale for assessing dysfunction beliefs and attitudes about sleep is the DBAS, developed by Morin (1993). The DBAS is a 28-item scale assessing thoughts, beliefs, attitudes, expectations, and attributions about sleep and insomnia. It comprises five item types (included is there reliability): (a) Misattributions or amplification of the consequences of insomnia (0.77), (b) Diminished perception of control and predictability of sleep (0.68), (c) Unrealistic sleep expectations (-0.09), (d) Misconceptions about the causes of insomnia (0.31), and (e) Faulty beliefs about sleep-promoting practices A person rates their level of agreement or disagreement on a 100-mm visual analog scale (strongly disagree to strong agree). The questions ask participants to consider their own personal sleep, an example of a question on the DBAS is ‘I need 8 hours of sleep to feel refreshed and function well during the day’. The results of the scale produce a score that indicates whether a person has more dysfunctional beliefs and attitudes about sleep. Testing of the scale has shown that is has good internal consistency for both poor (Cronbach’s $\alpha = 0.81$) and good sleepers (Cronbach’s $\alpha = 0.80$) (Morin et al., 1993).

Due to its wide use, the DBAS has also been amended into shorter versions (such as the DBAS- 16). This scale continues to assess people's dysfunctional beliefs and attitudes regarding sleep, just with fewer items to reduce administration time and it appears to maintain the psychometric properties of the original version (Carney et al., 2010). Internal consistency of the overall DBAS-16 has been shown to be acceptable (Cronbach's α=.821) (Carney et al., 2010). However, reliability of the subscales of the shorter version of the DBAS is less promising than the original DBAS (Effects: 0.75; Worry/helplessness: 0.66; Expectations: 0.58; and Medication: 0.47). Therefore use of shorter versions of the DBAS (DBAS-16) should be used with caution.

Sleep Beliefs Questionnaire (SBQ)

The Sleep Beliefs Questionnaire (SBQ) provides a global estimate of attitudes towards sleep and potential effects of disturbed sleep (Ware, Hood, Perlstrom, & Bond, 1996). The SBQ is a 40-item self-report questionnaire, which consists of 40 statements concerning a variety of potential effects of disturbed sleep on life across the following four categories: quality of life, loss of control, expected or standard effects, and social impact. The SBQ asks participants to think about people's sleep in general rather than their own personal effects of poor sleep. An example of a question is: 'People are less likely to function well at work if they get less than seven hours sleep'. To date, there is no published literature available on the psychometric properties of this scale. Some items of this scale were adapted in a new scale developed in the current study, for more information please see the Method section.

Anxiety and Preoccupation about Sleep Questionnaire (APSQ)

The APSQ was developed by Tang and Harvey, (2004). The 10 items that comprise the APSQ were derived from statements made by patients with primary insomnia as documented in previous research and measures worries about the consequences of poor sleep and worries about the uncontrollability of sleep. Participants were required to rate, on a 10-point scale, how true each of the statements was for them over the past three days (1 "not true", 10 "very true"). A total score for the APSQ was obtained by summing across each rating. The total scale is shown to have good internal consistency

(Cronbach's α) of 0.92 and correlates with the PSIQ and Beck Anxiety Index (BAI) (Tang & Harvey, 2004).

Sleep Beliefs Scale (SBS)

The SBS is a 20-item reviewed version of the Sleep Hygiene Awareness by Lacks and Rotert, 1986 (Adan et al., 2006). This scale measures three factors: Sleep-incompatible behaviours, Sleep wake cycle behaviours and Thoughts and attitudes to sleep. It asks people to rate what effect a list of behaviours has on people's sleep in general (not just their own sleep). The purpose of this scale is to assess people's knowledge and beliefs about sleep hygiene practices and their effect on sleep. Many items of this scale can be linked to sleep hygiene however other items are, as the authors described, intended to assess the detection of the wrong sleep beliefs and behaviours and cognitions incompatible with sleep. The internal consistency (Cronbach's α) of each factor was average to low (factor 1: 0.63; factor 2: 0.52; factor 3: 0.47). Also, Adan et al, (2006) found that the percentage of variance explained by the factors was not high (35.33%), when tested on a sample of Psychology University students aged between 18 and 33. To date, there has been no other published research testing the psychometric properties of this scale. This scale is used in the current study so for more detailed information please see the Method section. For the purpose of this study this scale is used to assess sleep hygiene beliefs.

Sleep Hygiene Awareness and Practice Scale (SHAPS)

The SHAPS was developed by Lacks (1987) and Lacks and Rotert (1986). The SHAPS contains three sections: sleep hygiene awareness, sleep hygiene practices, and caffeine knowledge (Brown, Buboltz & Soper, 2006). The first subsection has 13 items to measure participant knowledge of activities that are disruptive to sleep. The second subsection assesses caffeine knowledge and has 19 items to measure participant awareness of food, beverages, or drugs that are disruptive to sleep. The practice section of the SHAPS contains an additional 19 items asking participants how many nights per week they engage in activities that promote or inhibit sleep. The caffeine knowledge section and sleep hygiene practice section had modest internal reliability (Cronbach's α

= 0.55 and α = 0.47 respectively). The sleep hygiene awareness section demonstrated an acceptable internal reliability (Cronbach's α = 0.78) (Brown et al., 2006).

Sleep knowledge questionnaire (SKQ)

The SKQ was constructed by Gallasch and Gradisar, (2007) and is an extension of the (SHAPS). The SKQ extends on the SHAPS by also measuring knowledge of other behavioural treatments (specifically, stimulus control therapy and bedtime restriction). This scale, comprising 25 items, measures two factors: sleep hygiene knowledge and the knowledge of behavioural treatments. "For example, *"*going to bed hungry benefits sleep", related to sleep hygiene, "If you cannot fall asleep within 20 min, you should get out of bed and try again later*"*, related to behavioural treatments" (Gallasch & Gradisar, 2007, p. 65). The questionnaire requires participants to rate items as true, false or I don't know. Scoring of the SKQ was based on points for a correct response (2) and points deducted for incorrect responses (-2) and no points for "I don't know" response (0). Therefore higher scores on the SKQ reflect great sleep hygiene and knowledge of behavioural treatments. Also scores from both measures can be added to generate an overall sleep knowledge score (sleep quality was measured using the PSQI). The internal consistency for the scale was acceptable (Cronbach's α = 0.65). The PSQI is a common self-reported measure of sleep quality and sleep disturbances experienced in the past month, this scale has been found to have good internal consistency (Cronbach's α = 0.83) (Gallasch & Gradisar, 2007).

Sleep behaviour self-rating scale (SBSRS)

The sleep behaviour self-rating scale was designed by Kazarian, Howe and Csapo (1979; as cited in Morin & Espie, 2003). This scale assesses sleep-incompatible behaviours associated with a person's bedroom or bed. Participants answer questions regarding their behaviour pattern around bedtime, on a 5-point Likert scale ranging from 'never' to 'very often'. Participants are asked to consider how often they personally do certain behaviours before falling asleep or while in their bedroom (for example, watch TV, speak on the phone, eat or drink). The sleep behaviour self-rating scale has been shown to have acceptable internal reliability (Cronbach's α = 0.70).

Sleep behaviour self-rating scale, modified (SBSRS-M)

A modified version of the sleep behaviour self-rating scale was designed by Gallasch and Gradisar, (2007). The scale was modified to include items designed to measure the frequency that participants engage in sleep hygiene behaviours (for example, "I drink tea or coffee within 2 h of going to bed," and bedtime restriction, e.g. "I spend a lot of time lying awake in bed at night"). Similar to the original scale, items are scored on a 5-point Likert scale, ranging from 'never' to 'very often'. Thus a higher score is indicative of poorer sleep practices. The SBSRS-M originated as a 25-item scale but psychometric testing resulted in it being a 12-item scale with acceptable to low internal reliability (Cronbach's $\alpha = 0.61$) (Gallasch & Gradisar, 2007).

Sleep Hygiene Self-Test

The Sleep Hygiene Self-Test was designed by Blake and Gomez, (1998; as cited in Mastin, Bryson & Corwyn, 2006) to assess adults sleep hygiene (no published research could be found that described this scale). However, Mastin et al., (2006) reported that the scale has fair internal consistency (Cronbach's $\alpha = 0.54$).

The Sleep Hygiene Index (SHI)

The Sleep Hygiene Index (SHI) is a self-rated 13 item instrument which assesses sleep hygiene behaviours (Mastin et al., 2006). These 13 items were derived from combining information obtained from sleep hygiene studies along with the diagnostic criteria defined in the International Classification of Sleep Disorders for the diagnosis of inadequate sleep hygiene (Mastin et al., 2006). Participants are required to indicate how frequently they engage in specific behaviours and indicate the frequency: always, frequently, sometimes, rarely, or never. Each item is then coded with scores ranging from 5 (always) to 1 (never). The items are totalled yielding a global assessment score for sleep hygiene ranging from 13 to 65. Higher scores are indicative of more maladaptive sleep hygiene practices. The SHI is a 13-item questionnaire pertaining to personal sleep practices in a broad overview. The questions assess environmental and behavioural variables that could promote inadequate sleep. The authors of the scale found average internal reliability of the scale; Cronbach's $\alpha = 0.66$ (Mastin, et al., 2006).

Sleep Hygiene Practice Scale (SHPS)

The SHPS was developed by Yan, Lin, Hsu and Cheng (2010) to assess daily living activities and habits around that sleep that may have a negative impact on sleep. The scale was modified from previous scales measuring sleep hygiene (SHAPS, SHI and SHS-T). The SHPS is a self rating 30-item scale and measures four factors of sleep hygiene practices: sleep schedule and timing (interfering with homeostatic and/or circadian process of sleep); arousal-related behaviours (enhancing arousal through promotion of anxiety and/or conditioned arousal with sleep-related cues); poor eating/drinking habits prior to sleep; and poor sleep environment. The scale requires participants to rate how frequently they engage in the behaviour on a six-point Likert scale. The authors of this scale found fair to good internal reliability (Cronbach's α) of the factors for both good and poor sleepers: arousal-related behaviours (0.70 and 0.58); sleep environment (0.67 and 0 .65); eating/drinking habits (0.72 and 0.70); and 0.82 and 0.74 for sleep scheduling (0.82 and 0.74).

In summary, there are many questionnaires presented that were designed to assess sleep hygiene practices and knowledge (SBS, SHAPS, SKQ, Sleep Hygiene Self-Test, SHI, and SHPS). The SBS was used for the current study due to its easy administration time and questions were designed to assess sleep hygiene knowledge in general, not of an individual's own sleep. In regards to questionnaires designed to assess dysfunctional beliefs and attitudes about sleep limited scales are present in published research. The APSQ is designed to measure worries about the consequences of poor sleep and worries about the uncontrollability of sleep with people with insomnia. The DBAS is the most widely used questionnaire measuring people's beliefs and attitudes about sleep and reflects a person's own perceived sleep with personalised questions about their own sleep. Whereas, the SBQ is a questionnaire measuring people's beliefs and attitudes about sleep in a general format, meaning it asks participants to think about sleep in general rather than personalising the questions to just their own sleep. Limitations of this scale are the lack of psychometric information available to test whether this is a reliable scale as well as its length (40 items) in administration. Therefore, in order to measure people in the general community's beliefs and attitudes about sleep, irrespective of whether they have a diagnosable sleep problem or not, a new scale is needed.

1.3.2 Previous research on dysfunctional beliefs and attitudes about sleep

The majority of research on dysfunctional beliefs and attitudes about sleep has compared good and poor sleepers. There have been divergent findings on the role of dysfunctional beliefs and attitudes about sleep particularly about whether they can distinguish poor sleepers from good sleepers. Some research has found that dysfunctional beliefs and attitudes about sleep are more prevalent in poor sleepers compared to good sleepers, perhaps indicating they play a significant role particularly in people with sleeping problems. Whereas other research has found conflicting evidence, that is, that some dysfunctional beliefs and attitudes about sleep could not distinguish poor and good sleepers. The literature on dysfunctional beliefs and attitudes about sleep is presented below:

Firstly, dysfunctional beliefs and attitudes about sleep are commonly reported as a comparison between groups (Morin et al., 1993). For example, poor sleepers have more dysfunctional beliefs and attitudes about sleep than good sleepers (i.e. more elevated). This comparison is done between groups based on a significant difference in mean scores between groups. Therefore mean scores are presented for each dysfunctional belief about sleep but no cut off score has been derived to ascertain which score falls in the dysfunctional range. Carney et al, (2007) reported the mean total scores for the DBAS-16 which was scored on a 10-point Likert scale, with higher scores indicating more agreement and thus more dysfunctional beliefs. They found that good sleepers had a mean score of 2.96 and those with primary insomnia had a mean score of 4.31. Whereas Carney et al., (2010) reported that a cut off score of >3.8 (10-point Likert scale, with higher scores indicating more agreement and thus more dysfunctional beliefs) represented more unhelpful beliefs associated with clinically significant insomnia. Carney and colleagues (2010) proposed that a lower cut-off score may be useful to identify unhelpful sleep-related beliefs (particularly in highly screened primary insomnia-only and medical patient groups). They found that good sleepers had a mean score of 2.96, whereas all insomnia groups had a mean score of 5.23 on the DBAS-16. Despite this, other research has defined dysfunctional beliefs and attitudes about sleep based on whether it was higher in agreement as compared to other groups.

Morin et al., (1993) examined the beliefs and attitudes about sleep among 145 older adults with an average age of 68.2 years (range= 55-88 years) who were either classified

as having chronic insomnia or were self-defined good sleepers. Both groups were assessed using the DBAS. The authors found that the older adults with chronic insomnia showed stronger dysfunctional beliefs and attitudes about sleep compared to the self-defined good sleepers. The older adults with insomnia also showed stronger beliefs about the negative consequences of insomnia, expressed more hopelessness about the fear of losing control of their sleep, and more helplessness about its unpredictability. Morin et al., (1993) stated that some individuals with insomnia express more concern about the potential consequences of poor sleep than about the sleep problem itself. They also found that psychological distress is a distinguishing feature in those who seek treatment for sleep problems and those who do not. This indicates that they feel a great sense of hopelessness and helplessness regarding the uncontrollability and unpredictability of their sleep problems. The authors concluded that the clinical implications of these results highlight the need to not only look at the individual's behaviours around sleep but to also identify and target their dysfunctional beliefs and attitudes about sleep.

Similarly, Morin and Gramling (1989) compared the sleep patterns of older adults with and without insomnia complaints. Seventy-two subjects (good and poor sleepers) aged 60 years or older were assessed using a sleep questionnaire, sleep diary, mood measures and questions regarding desirable sleep patterns. These assessments were used in order to measure sleep patterns, mood disturbances, physical illnesses, life style variables, and sleep requirement expectations. Interestingly, they found that sleep hygiene practices were similar in both good and poor sleepers. This may suggest that irrespective of a sleep problem many people show both dysfunctional and correct behaviours around sleep. A large discrepancy was found between current sleep patterns and sleep expectations for poor sleepers. This finding was interpreted by the authors to indicate that the expectations around sleep contribute to the cycle of insomnia (for example, the expectation that people need 8 hours of uninterrupted sleep). Similar to previous research these findings suggest that education around variability in sleep at different ages and sleep requirements may modify a person's unrealistic expectations about their sleep (including the amount and pattern of sleep).

The role of sleep beliefs and attitudes has also been demonstrated in a range of participants with co-morbid mood disorders (Carney et al., 2007). The authors

examined the sleep beliefs of adults on five groups, they were defined as: having primary insomnia, good sleepers, fibromyalgia with comorbid insomnia, major depressive disorder with concomitant sleep disturbance, and Community Sleep Clinic patients with comorbid insomnia and mood disturbance. Four hundred and twenty-two adults, ranging in age from 20 to 79, were assessed using the DBAS-16 and a mood scale. The various groups with comorbid symptoms of mood and sleep problems and those with primary insomnia all showed dysfunctional beliefs about sleep. These findings are consistent with other research (Harvey, Schmidt, Scarna, Semler & Goodwin, 2005) suggesting that dysfunctional sleep beliefs and cognitions play a vital role in sleep problems by a variety of people with different presenting problems, such as co-morbid mood disturbances (Carney et al., 2007). This research highlights the possibly that beliefs about sleep are epiphenomenal meaning they may be more widespread in the general community than just confined to those with a diagnosed sleeping problem.

Carney and Edinger (2006) compared two groups, treatment-seeking people with insomnia and good sleepers, on their dysfunctional beliefs about sleep. The participants ranged in age from 20 to 79 years and were assessed using the DBAS. Those with insomnia were found to hold stronger beliefs about the consequences of poor sleep and losing control of sleep than the good sleepers. This is consistent with the notion that those with insomnia show greater feelings of hopelessness and helplessness about their sleep problems. There is also evidence that often people with primary insomnia overestimate their sleep problems possibly due to their dysfunctional beliefs and attitudes about sleep as well as other factors such as preoccupation with sleep and anxiety (Tang & Harvey, 2004).

Further research examining the role of dysfunctional beliefs and attitudes about sleep was conducted by Carney and colleagues, (2010). This research tested participants (N = 1384) with insomnia and good sleepers ranging from 18 to 89 years old (M = 42.6) using the DBAS-16. They found that all insomnia groups of participants exhibited higher levels of dysfunctional beliefs about sleep than good sleepers. These results should be interpreted with caution as the groups of insomnia participants differed on several characteristics (including co-morbidity) which were not statistically controlled.

Furthermore, a sub analysis of the factors that make up the DBAS-16 found that on beliefs about sleep needs, participants with insomnia were not significantly different than good sleepers. These results suggest that despite differences found between those with insomnia and good sleepers on their dysfunctional beliefs about sleep this should be interpreted with caution due to the limitations of the study. Also sub-analysis of the DBAS-16 found that participants with insomnia did not differ from good sleepers on beliefs about sleep needs, suggesting that dysfunctional beliefs about sleep are not restricted to insomnia participants. Other evidence has also not found differences on dysfunctional beliefs and attitudes about sleep between poor and good sleepers. This research will be further presented below.

Research by Ellis, Hampson and Cropley, (2007) examined the different between two groups on the DBAS-10 (shortened version); those with insomnia and good sleepers. Two hundred and fifty eight people with insomnia (M= 71 years) and one-hundred and twenty four good sleepers (M= 68 years) participated. Similar to previous research, they found that sleep related dysfunctional beliefs were higher among the insomnia group. However, when the factors and individual items of the DBAS-10 were examined between the two groups fewer differences were found. Some items of dysfunctional beliefs showed no discrimination between groups, for example on items such as staying in bed when not tired and napping. The authors concluded that when focusing on dysfunctional beliefs about sleep in treatment, further information is needed to determine which beliefs are more dysfunctional among those with insomnia. This suggests that not all dysfunctional beliefs about sleep are confined to participants with insomnia.

This finding is similar to other research which has not found a significant difference between groups (people with insomnia and good sleepers) on their dysfunctional beliefs about sleep (Voinescu et al., 2010). Two-hundred and seven participants aged 18 years and older were divided into two groups: healthy (M= 41 years) and depressed groups with sleep disturbances (M= 45 years). However, it is important to note that in the study participants were not recruited based on meeting Diagnostic Criteria for insomnia or good sleep. Participants were measured using the SBS, Sleep Disturbance Questionnaire, PSIQ and the BDI. The authors found no significant differences

between the groups on dysfunctional sleep beliefs. As a result they suggested that dysfunctional sleep beliefs are unlikely to be the primary cause of sleep problems.

Research highlighting the role of community perceptions of sleep was conducted by Lack (2007) who examined people's perception of a typical night's sleep. A sample of 250 adults (M= 38.5 years) plotted the sleep pattern of a typical night's sleep for a healthy young adult. They plotted a sleep curve from night time to awakening in the morning, with different depths of sleep across the night. Lack (2007) found that 70% of the public believes that a typical night sleep for a healthy young adult is that of unbroken and deep sleep. These findings are particularly important in understanding the community's perception of a typical night's sleep as awakenings during the night and light sleep (which are normal phases of sleep) may produce anxiety and worry. As more frequent awakenings and less deep sleep are experienced by older adults, unrealistic expectations about sleep may produce more anxiety and lead to insomnia

In summary, much of the research presented demonstrates that dysfunctional beliefs and attitudes about sleep play a role in people who are poor sleepers (including those with insomnia). Specifically, this research suggests that such dysfunctional beliefs and cognitions may be involved in exacerbating the vicious cycle of chronic insomnia (Morin et al., 1993). Thus the implications and importance of these findings suggests that dysfunctional beliefs and attitudes about sleep are important to address in those with sleep problems. However, other research (Carney et al, 2007) shows that dysfunctional beliefs about sleep are also present in those with other disorders, such as mood disorders. Also presented above is contrasting findings suggesting that dysfunctional beliefs and attitudes about sleep could not distinguish poor and good sleepers (Voinescu et al., 2010; Ellis, et al., 2007). These findings may suggest that dysfunctional beliefs and attitudes about sleep are not restricted to poor sleepers or those with a diagnosed sleep disorder and are possibly more widespread across the community. This is further shown in research by Lack, (2007) who found that in the general community people perceive a typical night's sleep to be that of an uninterrupted and deep sleep. However, sampling individuals from the general community across a wider range of age will provide a more comprehensive account of people's dysfunctional beliefs and attitudes about sleep.

1.3.3 Previous research on sleep hygiene.

Research on sleep hygiene has typically considered the relationship between sleep hygiene knowledge and sleep quality. There have been divergent findings on the role of sleep hygiene in relation to sleep quality. Some research has found that sleep hygiene knowledge is associated with better sleep quality (LeBourgeois et al., 2005; Suen, Tam & Hon, 2010; Adan et al., 2006). Other research has shown that sleep quality is not associated with sleep hygiene knowledge, but rather with sleep hygiene practice or behaviours (Brown et al., 2002; Gallasch & Gradisar, 2007). Overall, results show that sleep hygiene knowledge and/or practice plays a significant role in sleep. Research has found that poor sleep hygiene was higher in poor sleepers than good sleepers (Libman, Creti, Amsel, Brender, & Fichten, 1997). Much of the research on sleep hygiene has been conducted on adolescents/young adults in the general community, and results indicate that poor sleep hygiene is not confined to those who are poor sleepers (Yang et al., 2010). The research is presented below.

Firstly, it is important to discuss the scoring of sleep hygiene knowledge. In some research sleep hygiene knowledge is compared across groups, therefore higher scores compared to another group indicate better sleep hygiene knowledge (LeBourgeois et al., 2005). Sleep hygiene knowledge mean scores are presented for sleep hygiene behaviours (depending on the scale used) but no cut off score or range has been derived to classify scores. On questions regarding sleep hygiene, Suen et al., (2010) added sleep hygiene scores; scores could range from 0 to 154, with higher scores indicating more sleep hygiene knowledge/practice and found a mean score of 107.2. Adan et al., (2006) added scores of sleep hygiene beliefs using the SBS (higher scores correspond to better beliefs) and higher scores reflected better beliefs. Items that make up the scale were scored and mean values for each question were presented, with values ranging from 43.3 to 92% correct beliefs. Based on this, each research has its own way of scoring sleep hygiene beliefs and knowledge, but the direction of scores indicates whether it corresponds to better or poorer sleep hygiene knowledge.

LeBourgeois et al., (2005) investigated the relationship between sleep-hygiene practices and reported sleep quality in Italian and American adolescents. The study tested 1348 Italian and American adolescents (12 to 17 years old: M= 14.6) on the following self

report measures: Adolescent Sleep-Wake Scale, Adolescent Sleep Hygiene Scale, Pubertal Developmental Scale, and the Morningness/Eveningness Scale. Differences in overall sleep quality between the Italian and American samples were, for the most part, due to differences in sleep-hygiene practices. Furthermore the results showed that for both the Italian and American adolescents, emotional and cognitive domains from the Adolescent Sleep Hygiene Scale (ASHS) were the strongest predictors of overall sleep quality. This is of importance among young adults who may worry, feel sad, or engaged in cognitively stimulating activities just before bedtime. LeBourgeois et al., (2005) concluded that sleep hygiene is importantly related to sleep quality during adolescence.

This is similar to research on older adults Libman et al., (1997) tested 375 individuals with a mean age of 68 on the Sleep Behaviours Scale. The authors found that good sleepers indicated fewer problematic sleep behaviours than did poor sleepers. Specifically, these results show that good sleepers engaged in less activities around bed time than did poor sleepers, for example when they did awake during the night good sleepers were more likely to rest and relax; whereas poor sleepers were more likely to engage in behaviours disruptive to their sleep. There was no significant difference found between good and poor sleepers on coffee and alcohol use before bed.

Other research investigating whether sleep hygiene is associated with sleep quality among university students was conducted by Suen et al., (2010). Four-hundred university students from Hong Kong completed the PSIQ and questions relating to sleep hygiene knowledge, sleep hygiene practices and caffeine knowledge (which were based on information found in literature). The authors found that the university students had relatively poor sleep hygiene knowledge. More specifically, they found that participants held incorrect beliefs regarding the impact of taking a nap during daytime, the use of sleep medications, and using the bed for purposes other than sleep. In regards to caffeine, many university students identified that coffee contained caffeine but were unaware of the many other beverages they consume also contain levels of caffeine (for example, chocolate milk, honey green tea, and lemon tea). Similar to other research (LeBourgeois et al., 2005) it was found that sleep hygiene practices were significantly associated with poor sleep quality. On the basis of these results the authors concluded

that increasing sleep hygiene education is important in assisting university students to develop healthy sleep hygiene practices.

In other research Brown et al., (2002) conducted a study of 124 undergraduate psychology students (M age= 19) to determine if there was a relationship between sleep hygiene knowledge, sleep hygiene practice, and sleep quality. The participants completed the Sleep Hygiene Awareness and Practice Scale (SHAPS). Their findings are consistent with previous research that sleep practices are associated with sleep quality. However, they found that sleep hygiene knowledge was not associated with sleep hygiene practices. This means that knowing healthy sleep hygiene practices was not inevitably related to good sleep quality, but practicing (doing) healthy sleep hygiene behaviours was related to good sleep quality. The implications of this research highlight the possible need to provide education and assistance on changing sleep behaviours that negatively impact on sleep (not just education on what sleep hygiene is).

In similar research, the relationship between sleep knowledge, sleep practice and sleep quality was tested by Gallasch and Gradisar, (2007) on 946 participants (M= 38.5 years). Of these participants, 394 were identified as poor sleepers. All participants completed the SKQ, SBSRS-M, and the PSIQ. When factors such as age and gender (known to affect sleep quality) were controlled for no significant relationship was found between sleep knowledge and sleep quality. Despite sleep knowledge, there was an association between sleep quality and sleep practice (i.e. practice of both sleep hygiene and behavioural therapy techniques). The results indicate that sleep knowledge may only have a small influence on sleep quality, while the practice of sleep-promoting behaviours, together with age and gender, have a larger influence.

Sleep hygiene was further tested when comparing participants who are good sleepers (N = 89, M= 40.3 years old) and those with insomnia (N = 106, M = 40.7 years of age) (Yang et al., 2010). The participants completed the SHPS, PSQI, and ISI (subjective perception of the severity of insomnia scale). The authors found moderate to high correlations between sleep hygiene and sleep disruptions in good sleepers (age differences were not tested). Based on this the authors concluded that sleep hygiene is important not only in those with insomnia but also those in the general population. They

showed that the more maladaptive/ incorrect sleep hygiene practices an individual has the more disruptions they may experience in their sleep (Yang et al., 2010).

Some sleep hygiene behaviours were found to be more dysfunctional than others in research by Adan et al., (2006). They tested psychology students (n= 510), from Italy and Spain, aged between 18 and 33 (M= 22.80) on the Sleep Beliefs Scale (SBS). They found that the sleep hygiene behaviours with the most dysfunctional beliefs (i.e. participants incorrectly did not believe these had a negative impact on sleep) were doing intense physical exercise before going to bed, smoking before falling asleep, going to bed 2 hours later than habitual hour and recovering lost sleep by sleeping for a long time. However, sleep hygiene behaviours that the participants did not have dysfunctional beliefs about were drinking coffee or other substances with caffeine after dinner and taking a long nap during the day. The participants also acknowledged the positive effects of diverting one's attention and relaxing before bedtime and of sleeping in a quiet and dark room. Furthermore, gender differences were found and men have more wrong (dysfunctional) beliefs than females, especially with sleep-incompatible behaviours.

In summary, much research has highlighted the importance of sleep hygiene and its association with sleep quality. Libman et al., (1997) found that poor sleep hygiene in older adults was more prevalent in poor sleepers than in good sleepers. However, the majority of research presented has examined sleep hygiene in the general population, using adolescents and younger adults (LeBourgeois et al., 2005; Suen et al., 2010; Adan et al., 2006). These studies have found that sleep hygiene is related to sleep quality in adolescents and younger adults. Research also indicates that poor sleep hygiene practices are common among people in the general community (Yang et al., 2010). Other research has found that sleep quality is not associated with sleep hygiene knowledge but rather with sleep hygiene practices or behaviours (Brown et al., 2006; Gallasch & Gradisar, 2007). These results suggest that simply educating people on sleep hygiene may not be enough; rather education on putting sleep hygiene into practice may be more beneficial. Although there is a general appreciation of the importance of sleep-hygiene practices for good sleep quality, a better understanding of this relationship (e.g. by looking at different ages, especially older adults, and specific sleep hygiene

behaviours) would support further development of programs to educate the community about good sleep habits.

1.4 Sleep, age and gender

"Age is probably the single most important variable determining the quality and duration of sleep" (Morin & Espie, 2003, p.4). No published research to date has compared age groups on dysfunctional beliefs and attitudes about sleep and sleep hygiene knowledge. There are some differences in the amount of sleep and stages of sleep with age as well as the changing nature of insomnia with age (Morin & Espie, 2003). However, people's perception of this is important at different ages given that most reported sleeping problems occur in two age groups: adolescents and the elderly. The following sections will describe the sleep of adolescents, younger adults and older adults.

1.4.1 The sleep of adolescents

Previous research has shown that sleep problems are common among adolescents (LeBourgeois et al., 2005). At least 20-30% of all adolescents have a sleep problem at some stage. The problem is both not getting enough hours of sleep as well as irregular timing of sleep. Adolescents need an average of eight to nine hours sleep a night yet research suggests that they are actually getting an average of 7.6 hours of sleep per night (Cain, Gradisar & Moseley, 2011). Research suggests that this may be due to delayed bed times as well as early morning wake-up for school. In addition to this, the lifestyle of adolescents contributed to their poor sleep schedules including after school work, study, and social life (Carskadon, 2001). Most adolescents are then sleep deprived and try to "catch up" on their sleep by sleeping in on the weekends (Cain et al., 2011). Ultimately these behaviours are not contributing to good sleep patterns and parasomnia, delayed sleep onset and daytime sleepiness are frequently seen in adolescents (LeBourgeois et al, 2005). Furthermore, poor sleep hygiene in adolescents is associated with daytime sleepiness, behavioural problems, and emotional distress or dysfunction (LeBourgeois et al, 2005).

Recent studies have shown that adolescents have a general lack of knowledge about sleep and healthy sleep habits (Cortesi, Giannotti, Sebastiani, Bruni & Ottaviano, 2004; Grunstein & Grunstein, 2001). Cortesi et al., (2004) in a pilot study of a sleep-education

program with 425 Italian high school students, showed that students had low baseline levels of sleep knowledge and that those assigned to an education group, compared with controls, had higher sleep-knowledge scores post intervention and 3 months after completion of the course. This demonstrates that adolescents may be unaware of the behaviours that are contributing to sleep disturbances.

1.4.2 Sleep of young adults

Recent research proposes that at about 20 years of age there is a change in sleep patterns that is suggestive of a biological marker of the ending of adolescence. This is shown by a phase advance in the timing of evening melatonin secretion onset which is associated with the behavioural change of going to bed earlier (Roenneberg, Kuehnle, Pramstaller, Ricken, Havel, Guth & Merrow, 2004). Even though the sleep of young adults improves (biologically) sleep problems still persist in this age group (Brown et al., 2006).

Brown et al., (2006) stated that university students (who are typically young adults), reported significantly worse sleep than the general population. Suen et al., (2010) reported that in a survey of 1462 university students, 71% reported dissatisfaction with their sleep. Additionally, they found that at least two-thirds of college students in Hong Kong report intermittent sleep problems and one-third reported regular chronic sleep problems.

Sleep problems in young adults can be problematic given that a good quality sleep is important for this group of people due to their need to comprehend, analyse, and absorb information throughout the day (Suen et al., 2010). These sleep problems can therefore affect university students' mood, attention, and concentration which can be associated with poor academic performance (Brown et al., 2006).

Research outlining the sleep hygiene of young adults suggests that students with poor sleep hygiene practices had poor awareness of the behaviours that promote good sleep (Suen et al., 2010). This suggests that there is a lack of knowledge on healthy sleep hygiene practices to improve sleep in this cohort. It has been found that young college students commonly attempt to counter-balance their sleep problems by drinking coffee to improve alertness, have day time naps to compensate for a lack of sleep, and drink alcohol to increase sleepiness (Suen et al., 2010). In differing evidence, Gallasch and

Gradisar (2007) found that younger adults had better sleep hygiene knowledge than older adults but were less likely to implement these behaviours. This result may possibly highlight that the lifestyle of younger adults (such as social and work pressures) may stop them from implementing healthy behaviours around sleep. However, greater education may be needed to outline the benefits of carrying out healthy sleep hygiene behaviours.

1.4.3 The sleep of older adults

Research has shown that old adults need less sleep as they get older, typically an average of seven hours sleep a night, and many report that they have difficulty in sleeping without interruption throughout the night (Davis, Moore & Bruck, 2007). More than 25% of people 60 years of age or older complain of sleep difficulties (Morin et al., 1993). Many aging people experience insomnia and other sleep disorders on a regular basis. There are many possible factors contributing to the sleeping difficulties experienced by older adults.

Firstly, as people get older their sleep patterns change and in general they experience less time in stages 3 and 4 sleep (deep sleep) and REM sleep compared to younger adults (Ohayon, Carskadon, Guilleminault & Vitiello, 2004). The sleep of healthy older people is characterised by an increase in Stage 1 sleep and a decrease in Stages 3 and 4, resulting in more frequent and prolonged awakenings (Ohayon et al., 2004). Although total sleep time is not significantly reduced, older people spend more time in bed to achieve comparable sleep durations (Dement, Miles, & Carskadon, 1982). As a result, sleep efficiency (the ratio of time asleep divided by time spent in bed) decreases with aging.

Secondly, research has shown that sleep disturbances increase with age in parallel with the higher incidence of health problems, hormonal changes and medication use. For example menopause has been shown to impact on sleep (Freedman, 2002). Health problems can impact on sleep and older adults are at a higher risk of developing illnesses. These illnesses can result in changes in the body that may affect sleep, for example conditions such as arthritis are known to cause pain, which makes it difficult to fall asleep (Szuba et al., 2003). In addition to this, other conditions such as heart disease

and high blood pressure may cause a person to wake suddenly due to difficulties breathing Also frequent nighttime bathroom trips increase in older adulthood that may be due to conditions such as diabetes, which can cause frequent awakenings as well as difficulty then going back to sleep. Other illnesses which are higher in prevalence in older adults are Parkinson's, Alzheimer's disease and many other mental illnesses. Many of these illnesses may heighten anxiety which in turn impacts on sleep (McCurry et al., 2007). Often due to the conditions described above and many more, older adults are more likely to use medication. Many medications can impact on a person's sleep and some common medications known to interfere with sleep are some high blood pressure medications and antidepressants (Morin et al., 1993).

Lastly, the life-style changes that occur in later life accompanying retirement are likely to make the night-time sleep of older adults more interrupted (Morin & Gramling, 1989). As older adults enter this stage of life their daily routines change, for instance daytime napping may occur as well as a reduction in exercise and sunlight exposure.

Given all these changes that occur in older adults that impact their sleep they may have a higher propensity to overestimate these changes and their effect on sleep (Morin et al., 1993). Older adults have been found to hold some unrealistic sleep expectations as well as excessive concerns over the impact of a lack of sleep (Morin et al., 1993). Commonly, older adults overestimate or show excessive concern regarding their day-time functioning due to lack of sleep. For example, they may believe they are unable to function well the next day or carry out activities well due to a poor night's sleep. Gallasch and Gradisar (2007) found that greater age was associated with poorer sleep knowledge yet better sleep practices.

Although some of these age-related changes are not necessarily pathological, sleep disruptions clearly exceed these normative changes in many elderly people (Morin et al., 1993). There is a widespread assumption that disturbed sleep is a 'normal' consequence of aging (Morin & Gramling, 1989). Research has shown that insomnia is a legitimate complaint in late life and is not merely the result of aging. This assumption causes sleep complaints amongst the elderly to be overlooked and they may remain undiagnosed.

1.4.4 Gender differences in sleep

Limited research has investigated gender differences in dysfunctional beliefs and attitudes about sleep and sleep hygiene. However, more research has investigated gender patterns in sleep. In terms of sleep and sleep quality, research shows that there is a gender difference in the sleep of people aged over 60, with females being one and a half times more likely to experience insomnia than males (Zorick & Walksh, 2000). Similar research has also found that when rated on the PSQI, more females than males experienced sleep problems (Vitiello, Larsen and Moe, 2004). However, when sleep is measured objectively it was found that females had greater total sleep time, sleep efficiency, stage 3 and stage 4 sleep, REM sleep and less arousal following sleep onset when compared to men (but not total wake time and sleep latency). Conversely, other research did not find a big difference in the sleep of males versus females, with older females only sleeping slightly worse than older men (McCrae et al., 2003). McCrae and colleagues (2003) found that the numbers of non-complaining (defined as poor sleepers who did not report insomnia complaints) females were higher in the ages of 75 years and older than females who were 60-74 years of age.

Gallasch and Gradisar (2007) found that men had poorer sleep quality than females (testing a wide age range). However, females reported more frequent sleep problems and disturbances than males. This finding is consistent with other health complaints, whereby women may be more proactive in seeking assistance for their sleep problems than men. In turn, if women seek more assistance for sleep problems they may be more likely to have greater sleep knowledge and therefore better sleep quality. Adan et al., (2006) looked at gender differences by in sleep hygiene behaviours in younger adults. The younger adult males were found to have less sleep hygiene knowledge than younger adult females, especially with sleep-incompatible behaviours.

Overall, some research suggests that older females are more likely to seek help or report their sleeping problems than older males. Yet other research reports that males overall have poorer quality of sleep than females. Limited research is available to specifically compare both genders (of younger and older adults) on dysfunctional beliefs and attitudes about sleep.

1.5 The current study

1.5.1 Rationale

Overall, evidence suggests that dysfunctional beliefs and attitudes are an important factor in perpetuating sleeping problems. As well as this, research shows that dysfunctional (incorrect) sleep hygiene beliefs impact on sleep and is associated with quality of sleep. Much research has investigated community beliefs and attitudes about a range of other mental illnesses finding areas of importance to educate the general public. However, to date very little research has investigated community beliefs and attitudes about sleep and no published research appears to have examined such beliefs and attitudes from a developmental perspective. Furthermore there are limited scales that assess community beliefs and attitudes about sleep. The most widely used scale to assess dysfunctional beliefs and attitudes about sleep is the DBAS; however this scale assesses this from an individual's perspective. The SDQ is a scale assessing dysfunctional beliefs and attitudes about sleep from a community perspective; however this scale has a lack of psychometric properties. This study will contribute a new scale on sleep beliefs that can be used within the general community.

Dysfunctional beliefs and attitudes about sleep have been found in research examining the differences between good and poor sleepers. However, other research was unable to distinguish between good and poor sleepers based on their dysfunctional beliefs. This suggests that dysfunctional beliefs and attitudes about sleep may be more widespread across the general population (irrespective of reported sleeping problems). This research will add to the body of research on sleep beliefs, attitudes and expectations and will provide essential information on young and older adult's beliefs and attitudes about sleep and their understanding of healthy sleep behaviours. Obtaining this information will be important in developing educational programs for educating and reducing sleep problems among both younger and older adults, who are particularly vulnerable to sleep/wake problems. This study will also contribute to information on points to target in educating the general population on healthy sleep practices at different ages. If this research identifies that community misperceptions about sleep are common then public education about what constitutes 'good' sleep at different ages and changing widespread faulty perspectives may be helpful in the prevention and/or treatment of insomnia. This

information is highly clinically relevant as insomnia is treated using CBT, whereby one goal of such treatment is to change people's dysfunctional beliefs.

1.5.2 Aims and hypothesis

The current study was divided into two phases. The aims of Phase One are described below and in Phase Two each hypothesis is described.

Phase One

The aim of Phase One of the current study was to develop a scale that assesses community beliefs and attitudes about sleep, namely the Views on Sleep Scale (VOSS) was developed. The VOSS has been compiled for the present study from the Dysfunctional Beliefs and Attitudes about Sleep (DBAS, Morin et al., 1993) and the Sleep Beliefs Questionnaire (SBQ, Ware et al., 1996). This new scale was developed to assess an individual's beliefs and attitudes about people's sleep in general. This measure was examined on its psychometric properties to examine whether it is has internal consistency and factor structures that make up the scale to assess community beliefs and attitudes about sleep.

The second aim of Phase One was to test the internal consistency and factor structure of the Sleep Beliefs Scale (SBS: Adan et al., 2006). The SBS measures people's beliefs about sleep hygiene behaviours. Previously the SBS was tested on psychology students aged between 18 and 33 from Italy and Spain and therefore the aim was to test the internal consistency and factor structure of this scale using a wider age range and using an Australian population (using the same sample as the VOSS).

For both the VOSS and SBS it was of interest to determine whether robust factors within each scale could be identified in each Phase, so that in Phase Two the different factors could be compared across age groups in a MANOVA design. If robust factors could not be confirmed for each questionnaire groups would be compared using a single summated score (provided good internal consistency was found).

Phase Two

The aim of Phase Two of the current study was to compare the perceptions of two age groups (18 to 25 year olds and 60 years and older) in their beliefs and attitudes about

sleep. The two groups were expected to significantly differ because they are at the two ends of the adult age spectrum and sleep changes as a function of age. Developmental differences in beliefs and attitudes about sleep were examined by comparing people in the community 18 to 25 years and 60 years and older in their beliefs and attitudes about sleep. The two groups were tested using the VOSS, SBS and the Sleep Plot (associated hypothesis and rationale for each scale is described below).

VOSS

The VOSS was used to examine dysfunctional beliefs and attitudes about sleep.

It is hypothesised that there will be a significant difference between the younger (18-25 years old) and older (60 years and older) adult groups on the VOSS scores. It is expected that the older adults will have lower VOSS scores, meaning they hold more dysfunctional beliefs and attitudes about sleep than the younger group. No differences across gender are expected.

Rationale: Previous studies have found that people with insomnia/poor sleepers have more dysfunctional beliefs and attitudes about sleep than healthy sleepers (Morin et al., 1993). However, other studies have shown that groups of people with insomnia and healthy sleepers are comparable in holding dysfunctional beliefs and attitudes about sleep (Voinescu, Coogan, & Orasan, 2010). Therefore, it may appear that dysfunctional beliefs and attitudes about sleep are distributed across the community, irrespective of having a sleep disorder present. Most studies have looked at dysfunctional beliefs and attitudes about sleep among older adults. Given sleep becomes lighter and more sleep problems occur in older adults it is more likely they will be more concerned about their sleep than younger adults. Therefore it has been hypothesised that older adults (both genders) are more likely to have dysfunctional beliefs and attitudes about sleep and its potential consequences than younger adults (both genders).

SBS

The SBS was used to examine dysfunctional beliefs about the effects of behaviours on sleep, known as sleep hygiene.

It is hypothesised that there will be a significant difference between the younger (18-25 years old) and older (60 years and older) adult groups on the SBS scores. It is expected that the younger adults will have lower SBS scores, meaning they have less sleep

hygiene knowledge than the older group. It is also hypothesised that males (both younger and older) will have less sleep hygiene knowledge than the females (both younger and older).

Rationale: Previous research has found that poor sleep hygiene knowledge is present in both age groups. When examining age and sleep knowledge, Gallasch and Gradisar, (2007) found that greater age was associated with poorer sleep knowledge. However, research has found that older adults have better sleep practices than younger adults (Gallasch & Gradisar, 2007). This may indicate that older adults are more concerned about the behaviours that may impact sleep. There is also a vast amount of research demonstrating that young adults and adolescent have poor sleep hygiene knowledge (LeBourgeois et al, 2005; Adan et al., 2006; Suen et al., 2010). Given that research has found that older adults are often concerned about their sleep and have dysfunctional beliefs and attitudes about sleep (see above) it is expected that they will be more concerned with understanding and practicing the correct sleep hygiene behaviours to improve sleep than younger adults.

Previous research by Adan et al., (2006) found younger males had less sleep hygiene knowledge than younger females. It is also hypothesised that this gender difference will persist across all ages.

Sleep Plot

Lastly, a tool designed by Lack (2007) was used, with participants asked to plot the sleep patterns of healthy adults of two different ages (18 year old Sleep Plot and a 65 year old Sleep Plot) across a typical night of sleep. Given there is a lack of previous research concerning perspectives on plotting the sleep of their own age cohort and other age groups, and sleep problems are prevalent in both age groups (elderly and young adults) the following seven (7) hypotheses using the Sleep Plot are exploratory, rather than directional:

1. *Are the Sleep Plots of the 18 versus 65 year olds significantly different?*
2. *Are the combined Sleep Plots (of the 18 and 65 year olds) significantly different as a function of the age and gender of the respondent (younger versus older adult groups, males versus females)?*
3. *Are the 18 year old Sleep Plots significantly different based on the age and gender of the respondent?*

4. *Are the 65 year old Sleep Plots significantly different based on the age and gender of the respondent?*
5. *Is there a significant difference in how the younger respondents (18 to 25 years old) plotted the sleep of the 18 versus 65 year old Sleep Plots?*
6. *Is there a significant difference in how the older respondents (60 years and older) plotted the sleep of the 18 versus 65 year old Sleep Plots?*
7. *It is hypothesised that both age groups will provide plots of unrealistically "deep" and uninterrupted sleep across the night for both the 18 and 65 year old Sleep Plots.*

Rationale for Hypothesis 7: Lack (2007) found that the predominant characterisation of healthy sleep by the general public is that of an uninterrupted deep sleep, in a U shape (on the Sleep Plot). In line with Lack's findings it is expected that all participants will have unrealistic expectations of a typical night's sleep.

Chapter 2: Methodology

2.1 Phase One: Psychometric properties of two scales

2.1.1 Participants

In Phase One of the study 209 adults (119 females and 90 males) from the general community participated. The participants ranged in age from 18 to 86 (M = 41, SD = 15). The participants were recruited from university, various workplaces, organisations and by word of mouth. The aim of recruitment was to get a community sample of adult participants and efforts were made to ensure a good range of education level by targeting workplaces (not with a strong bias to university students) and no particular screening criteria were set.

A questionnaire package was handed out to potential participants. Each participant received a plain language statement (please see Appendix A for Information to Participants Involved in Research letter) and consent was implied by completion and return of the questionnaires. Only those who completed and returned the questionnaires participated in the study. Packages were given to those who had initially expressed a willingness to be involved and the response rate was 41.3%. No data was obtained from unreturned questionnaires. It can only be speculated why people did not participate in this study and these reasons may be they did not have time, forgot to send back the questionnaires, were not interested in participating, and many other possible reasons.

2.1.2 Materials

In Phase One the participants were presented with two questionnaires: the Views on Sleep Scale (VOSS) and the Sleep Beliefs Scale (SBS). All participants were only required to provide their age and date of birth. These two questionnaires assessed beliefs about sleep and the possible impact of a range of sleep behaviours on sleep. The following section describes each questionnaire and the scoring procedure for each.

2.1.3 Views on Sleep Scale (VOSS):

The VOSS was created for this study. It contains 25 items and was created to measure various beliefs, attitudes, expectations, and attributions about sleep and insomnia. The items in the questionnaire were derived from many sources: 11 items were from Morin, et al., (1993), 5 items from Ware, (1996), and 9 items created by the current researcher. The nine items added by the current researcher reflected gaps and key issues in the literature. The single main source for this new scale was thus Morin et al., (1993) Dysfunctional Beliefs and Attitudes about Sleep (DBAS) Scale. This is a widely used and accepted scale that has been developed to assess an individual's beliefs and attitudes about their own sleep. Only relevant selected items of Morin's DBAS Scale were used. Importantly, items from the DBAS (and other sources as relevant) were reworded from personalised questions regarding sleep beliefs and attitudes about the person's own sleep to more generalised questions. For example, from 'I need 8 hours of sleep to feel refreshed and function well during the day' to 'People need 8 hours of sleep to feel refreshed and function well during the day'. The scale was also changed from the subject rating their level of agreement/disagreement on a 100-mm visual analog scale to a Likert scale (2 = strongly agree, 1= agree, 0 = neither agree nor disagree, -1 = disagree, -2 = strongly disagree) to make it easier to complete and score. When completing the VOSS, participants were instructed to indicate to what extent they agreed or disagreed with each statement by circling the appropriate response from the five alternatives (please see Appendix B for the VOSS).

The purpose of administering the VOSS in Phase One was to examine the internal reliability of the sale, as well as to explore if underlying factors organised the items of the scale. Based on the statistical analysis, the questionnaire may be adjusted. The internal consistency of the overall scale was good (Cronbach's $\alpha = 0.792$).

2.1.4 Sleep Beliefs Scale (SBS):

The SBS was developed by Adan, et al., (2006) and is a 20-item revised version of the Sleep Hygiene Awareness and Practice Scale by Lacks (1987) and Lacks and Rotert (1986). The SBS asked participants to determine whether a list of behaviours may influence the quality and/or quantity of sleep. Participants are asked to indicate whether

they believe a behaviour may produce a *positive*, *negative* or *neither* effect on sleep in people in general, by ticking the appropriate box. Item 13 was reworded from "Trying to fall asleep without having a sleep sensation", to "Trying to fall asleep without feeling tired", to be understood easier in common language. The SBS was scored on a Likert scale, 1 = positive effect, 0 = neither effect, -1 = negative effect. The published psychometric properties obtained for the SBS suggest that this instrument is effective and reliable. Aden et al., 2006 found good internal consistency (Cronbach's $\alpha = 0.714$) and their factor analysis extracted three factors labelled 'Sleep-incompatible behaviours' (eight items), 'Sleep–wake cycle behaviours' (seven items) and 'Thoughts and attitudes to sleep' (five items) (please see Appendix C for the SBS).

As the SBS has only been used in one previous study, the scale had not been tested on an Australian population. Therefore the purpose of administering the SBS in Phase One of the current study was to perform a confirmatory factor analysis of the SBS and examine its internal reliability.

2.1.5 Procedure

Prior to data collection, ethical approval was obtained from the Victoria University Human Research Ethics Committee (VUHREC) (please see Appendix D for ethics approval letter). Five hundred and five questionnaire packages (VOSS and SBS) were handed out to potential participants from various workplaces, organisations (such as church, bowls and tennis groups) and through word of mouth. Permission was obtained from workplaces and organisations to distribute questionnaires to anyone who would like to participate in the study. Participants were also asked to take additional questionnaire packages for family members, their spouse or friends to complete. The participants were provided with an Information to Participants Involved in Research letter outlining that participation is voluntary and consent would be implied by completion and return of the questionnaires. Firstly, participants were asked to provide their gender and age. On both questionnaires participants were asked to not make reference to how items may influence their sleep in particular, but to the effects they think these behaviours have on people in general. It was estimated that the two questionnaires would take participants approximately 15 minutes. Participants were asked to mail back their filled in questionnaires to the Psychology Department at

Victoria University, St Albans Campus (Melbourne Australia), in the self-addressed and stamped envelopes provided with the survey packages. To aid in maintaining confidentiality if participants completed the questionnaire package at the time the researcher distributed them they were asked to put their questionnaires in the sealed envelope provided.

2.2 Phase Two: Differences between groups of different ages on the VOSS, SBS and Sleep Plot.

2.2.1 Participants

In Phase Two of the study there were two groups of participants, group one consisted of younger participants (aged between 18 and 25) and group two consists of older participants (aged 60 years and older). In group one there was 113 (67 female and 46 male) participants between the ages of 18 to 25 (M = 21.41, SD = 2.43). The participants were from the general community and were recruited via word of mouth, workplaces (retail stores), and university lectures (efforts were made to ensure a good range of education level by targeting workplaces not with a strong bias to university students or graduates). In group two there was 110 (62 females and 48 males) participants aged 60 years and older (M = 72.13, SD = 7.71). The participants are from the general community and were recruited via workplaces, community organisations, church, and sporting groups. The response rate was 42.2%. No data was obtained from unreturned questionnaires. It can only be speculated why people did not participate in this study and these reasons may be they did not have time, forgot to send back the questionnaires, were not interested in participating, and many other possible reasons.

2.2.2 Materials

In Phase Two the participants were presented with three questionnaires: the VOSS (amended version based on Phase 1), the Sleep Beliefs Scale (SBS, no amendments made on the basis of Phase One data) and the Sleep Plot. On the questionnaire, all participants were only required to provide their age and gender. These three questionnaires assessed beliefs about sleep, sleep behaviours and perceived normal sleep. The following section describes each questionnaire and the scoring procedure for

each (please see Appendix E for the amended VOSS questionnaire, Appendix C for the SBS, and Appendix F for the Sleep Plot).

2.2.3 Views on Sleep Scale (VOSS)

The items in the questionnaire were derived from many sources: 11 items were from Morin, et al., (1993), 4 items from Ware, (1996), and 5 items created by the current researcher. The single main source for this new scale was thus Morin et al., (1993) Dysfunctional Beliefs and Attitudes about Sleep (DBAS) Scale.

Based on an exploratory factor analysis conducted in Phase One of the current study the VOSS was amended (see Phase One for more detailed information on the VOSS). The amended scale went from a 25- item scale to a 20- item scale; five items were deleted.

To assist with analysis and interpretation each item response on the VOSS was given a numerical rating (strongly agree = 1, agree = 2, neither agree nor disagree = 3, disagree = 4 and strongly disagree = 5). Please note scoring was changed from Phase One to make interpretation and understanding of scores easier.

An exploratory factor analysis revealed five factors (details presented in the Phase One Results section) being: Amplification of the consequences of poor sleep (items: 1, 5, 6, , 10, 11, 13, 19, 20); Exaggerated Sleep Expectations (items: 3, 8, 17); Sleep Medication (items: 2, 4, 9); Insomnia, health and behavioural issues (items: 7, 12, 15, 18); and High Sleep Expectations (items: 14, 16). When re-tested the internal reliability of the overall scale was very high with the Phase Two sample (Phase One α= 0.792, Phase Two α= 0.917) and the factors also showed good, average and poor internal consistency (Amplification of the consequences of poor sleep= 0.768; Exaggerated Sleep Expectations= 0.467; Sleep Medication= 0.613; Insomnia, health and behavioural issues= 0.622; and High Sleep Expectations= 0.513).

Due to differences found in a confirmatory factor analysis conducted in Phase Two a VOSS Sum Score was used. The VOSS would be used for the current study in terms of collectively adding each item of the VOSS (Sum Score) so that lower scores were

indicative of more dysfunctional beliefs and attitudes about sleep (described as 'dysfunctional' by Morin et al., 1993). Please note that for the 20 items the highest possible VOSS score was 100 (no dysfunctional beliefs and attitudes about sleep) and lowest possible score was 20 (dysfunctional beliefs and attitudes about sleep). Mean individual scores of the VOSS that were less than 2.3 were considered dysfunctional due to lower scores (closer to 1, meaning 'strongly agree') indicating more dysfunctional and catastrophising of sleep and its consequences.

2.2.4 Sleep Beliefs Scale (SBS)

In Phase One of the study a confirmatory factor analysis of the SBS (see Results Phase One) revealed the current study did not find similar factors to Adan et al., (2006). The factor loadings were unable to be distinguished based on the items that make up each factor (i.e. there was no clear theoretical grounds to distinguish each factor). Based on this, it was decided that the SBS would be used for the current study in terms of collectively adding each item of the SBS (Sum Score) so that lower scores indicate more incorrect beliefs/less sleep hygiene knowledge. Please note that for the 20 –items the highest possible SBS score is 60 (more sleep hygiene knowledge) and lowest possible score is 20 (less sleep hygiene knowledge). Also, individual items would be examined to determine participant's knowledge on specific sleep hygiene items. On individual questions of this scale values could range from 1 to 3. To truly reflect poor sleep hygiene knowledge mean individual scores that were below 2 (i.e. closer to 1) reflect that people were more likely to incorrectly agree that behaviours had a positive effect on sleep (1 = 'positive effect', 2 = 'neither effect', 3 = 'negative effect'). The internal reliability (Cronbach's α) for the 20-items of the SBS was good (α= 0.700) (see Phase One for more detailed information about the SBS).

To assist with analysis and interpretation each item response on the SBS was given a numerical rating (positive effect = 1, neither effect = 2, negative effect = 3). Please note scoring was changed from Phase One to make interpretation and understanding of scores easier. A total overall score for the SBS was then calculated. Responses for items 5, 9, 15, and 19 were reversed to match other items, such that higher responses were indicative of correct opinions that the listed behaviours have a negative influence on sleep.

2.2.5 Sleep Plot

In the Perceived Normal Sleep Cycle Plot (Lack, 2007) participants were asked to plot what they believe the normal sleep cycle and pattern looked like for two different age groups (in this study it is referred to as the Sleep Plot). All participants are given two blank graphs and were required to draw two graphs of normal sleep patterns, one for a healthy 18 year old and the other for a healthy 65 year old. In the Sleep Plot participants are able to draw waking periods, non-waking periods and what they believe happens in terms of depth of sleep across the night. The instructions of the Sleep Plot asked participants to draw two graphs of normal sleep patterns, one for a healthy 18 year old and the other for a healthy 65 year old. Participants were asked to plot a continuous curve from awake (at night) to awake (morning), with time of night being on the horizontal axis. Wakefulness and sleep at varying depths were on the vertical axis. The Sleep Plot was tested for psychometric properties and was found to be a reliable scale for measuring a person's views on normal sleep patterns (Lack, 2007).

The scoring of the Sleep Plot was taken from an abstract using the Sleep Plots (Lack, 2007). The continuous curve for each respondent was distinguished with one of four different values (0=wake, 1= light sleep, 2= deep sleep, 3= very deep sleep) at 15 half-hourly time points across the night. The mean curves were calculated separately for the younger participants plotting the sleep for a healthy 18 year old and a healthy 65 year old, and the older participants plotting the sleep for a healthy 18 year old and a healthy 65 year. Thus the Sleep Plot yielded two different sets of dependent variable scores for each participant.

2.2.6 Procedure

Prior to data collection, ethical approval was obtained from the Victoria University Human Research Ethics Committee (VUHREC) (please see Appendix D for ethics approval letter). Five hundred and forty questionnaire packages (with the VOSS (amended version), SBS and the Sleep Plot) were handed out to potential participants recruited from various workplaces, organisations and by word of mouth. Permission was obtained from workplaces and organisations to distribute questionnaires to anyone who would like to participate in the study. Participants were also asked to take

additional questionnaire packages for family members, their spouse or friends to complete who were in the appropriate age range. The participants were provided with an Information to Participants Involved in Research letter outlining that participation is voluntary and consent would be implied by completion and return of the questionnaires (please see Appendix G for Information to Participants Involved in Research letter). Firstly, participants were asked to provide their gender and age. On all questionnaires participants were asked to not make reference to how items may influence their sleep in particular, but to the effects they think these behaviours have on people in general. It was estimated that the three questionnaires would take participants approximately 20 minutes. Participants were asked to mail back their filled in questionnaires to the Psychology Department at Victoria University), in the self-addressed and stamped envelopes provided with the survey packages. To aid in maintaining confidentiality if participants completed the questionnaire package at the time the researcher distributed them they were asked to put their questionnaires in the sealed envelope provided.

2.3 Data Analysis

To analyse the data obtained, the PASW Statistic 18.0 (SPSS Statistics) and IBM SPSS Statistics 20.0 program for Microsoft Windows was utilised. Microsoft Excel was utilised to examine and develop graphs. Each age groups mean scores were entered into Microsoft excel. Based on the means, line graphs were developed to show visually the mean differences in graph format.

2.3.1 Data screening

Prior to analysis, the data was screened for missing data, outliers and assumption testing for the parametric test being used (for example normality). Firstly, demographic and descriptive data was obtained through frequency statistics. When missing data was found, it was replaced using the Estimated Means Method. Outliers that appear inconsistent with the remainder of the data set can distort the direction and overall results (Keppel & Wickens, 2004). Examination of outliers was carried out using box plots and histograms. When found, outliers were deleted and treated like missing data.

2.3.2 Psychometric properties of the scales

In this study both exploratory and confirmatory factor analyses were used. An exploratory factor analysis was used with the VOSS in Phase One due to it being a newly developed questionnaire. This is due to research that suggests that exploratory factor analysis is most appropriate in the initial stages of scale development, whereas confirmatory factor analysis is a more powerful took in the second stage of examining a new scale where factors have been developed (Floyd & Widaman, 1995). Therefore, a confirmatory factor analysis was used for both the VOSS (Phase Two) and SBS (Phase One) as factors were known from previous research and the purpose of the analysis was to confirm these.

2.3.3 Hypothesis testing

When the assumptions of parametric tests were violated an alternative and more appropriate test was used. In this study the test that was used when normality was violated was a non- parametric test, namely the Mann-Whitney U Test, in which normality is not considered critical (Coakes & Steed, 2007). However, when assumptions were not violated parametric tests such as ANOVA, MANOVA, repeated measures and two-way MANOVA's were used.

While the issue of alpha inflation was considered (due to the number of tests undertaken), it was decided that alpha adjustments were not necessary as all the analysis conducted were pre-planned and deemed necessary for the current research study (Keppel & Wickens, 2004). Alpha level was set at 0.05 (unless otherwise stated).

Chapter 3: Results

This chapter presents the results for the two phases. Phase One consists of the factor and reliability analyses conducted on the VOSS and SBS questionnaires and the findings are presented in two parts. Phase Two examines the results of all three measures (VOSS, SBS, and Sleep Plot), presented in three parts.

3. 1 Phase One: Psychometric properties of two scales.

3.1.1 Demographics and Descriptive data

There was a wide age range across the 209 participants (18 to 86 years) with a mean age of 41.45 years (SD= 15.33). There was slightly more females, with 119 females and 90 males participating in the study.

3.1.2 Factor Analysis of the Views on Sleep Scale (VOSS)

Data screening

Preliminary data screening revealed 10 outliers in the sample and these variables were deleted and replaced using the Estimated Means Method. There was less than 3.7% of missing data for individual variables and the Estimated Means Method was used to replace the missing data. A number of variables were positively or negatively skewed, however factor analysis is robust to the assumption of normality (Tabachnick & Fidell, 2007). Even though differences in skewness among variables may suggest curvilinearity, scatter and box plots were examined and revealed that many items were near normally or were normally distributed (i.e., showed no evidence of true curvilinearity). Furthermore, transformations are not considered favourable due to the goals of analysis (Tabachnick & Fidell, 2007). The other assumptions of this test were satisfied in that the sample size of 209 is considered “fair” for the principal components analysis method of factor analysis. Additionally, correlation matrixes were examined and multicollinearity and singularity were not present.

Factor analysis

An exploratory factor analysis was run on the VOSS to identify underlying common factors that may organise the 25 items of the VOSS, and reveal any extraneous items. The factor analysis conducted was done with principal component analysis as the extraction method (using SPSS version 18). In order to clarify the underlying structure of the data set, a varimax rotation method was used. Kaiser-Meyer-Olkin's measure of sampling adequacy was 0.78, indicating that the factor analysis should yield distinct and reliable factors. Bartlett's test of sphericity was significant (968.03 (190), p= 0.00) indicating that the correlation matrix was not an identity matrix, and that it was appropriate to proceed with the exploratory factor analysis.

The components were examined, determined by the scree plot and the number of eigenvalues that exceeded 1.0. Criterion for significant correlation was set as .3 prior to analysis. This is a moderate loading and pure variables are considered to have loadings of .3 or greater on one factor (Coakes & Steed, 2007). Analysis revealed four variables with two or more moderate loadings (i.e. complex factors). A higher criterion for significant correlation was therefore set as 0.45 (20% variance overlap between variable and factor). With use of this criterion only one factor was found to be complex. When complex factors were found the item was adapted to the factor of highest loading, unless otherwise specified. However, please note question 15 had a low factor loading on only one factor and was therefore retained before the higher criterion of 0.45 was set.

The scree plot of the exploratory factor analysis of the VOSS using the extraction method of principal components indicated that seven factors with an eigenvalue greater than 1.00 should be retained, accounting for 55.55% of the total sample variance. On inspection of the factor loadings and further consideration of selected items decisions were made to delete the following items (please see Appendix H for factor loadings of the deleted items and statistics for all 7 factors):

Item (6) *poor sleep leads to nausea and headaches*, was removed from the scale because it is a double-loaded question. Item (19) *sleeping tablets are only effective for short-term sleeping problems,* was removed from the scale due to being the only item to load onto a factor. A factor with one variable is not considered to be a valid factor. Items (17) *herbal remedies can be a big help for insomnia* and (24) *many false claims*

are made about relief for sleep problems with herbal remedies, were removed. These items were deleted for several reasons such as a high score on these items does not necessary reflect an incorrect belief about sleep and a consequent decision to remove questions about herbal remedies. Item (5) *most people wake up a few times during the night*, was removed from the scale due to loading highly (>0.5) on more than one factor.

Upon deletion of the 5 items above, the scree plot indicated that five factors (*F*) with an eigenvalue greater than 1.00 should be retained, accounting for 53.11% of the total sample variance (*F* 1: 16.02%; *F* 2: 26.70%; *F* 3: 36.70%; *F* 4: 46.24%; *F* 5: 53.11%). Please refer to Table 3.1 for the variable loadings on factors of the VOSS and Table 3.2 for reliability coefficients of the factors. The following factors were thus developed:

Factor 1 contains 8 items; this factor was named 'Amplification of the consequences of poor sleep'. Factor 1 consists of the following 8 items: (1) *People need 8 hrs of sleep to feel refreshed & function well during the day;* (5) *When people feel tired, have no energy or just seem not function well during the day, it is generally because they did not sleep well the night before;* (6) *Poor sleep can lead to greatly disturbed family/personal relationships;* (10) *A poor night's sleep will interfere with activities the next day;* (11) *Poor sleep leads to people becoming socially withdrawn;* (13) *When people feel irritable, depressed, or anxious it is because they did not sleep well;* (19) *Sleep problems are a major cause of life problems;* and (20) *Without an adequate night's sleep it is hard to function the next day.*

Factor 2 contains 3 items; this factor was named 'Exaggerated sleep expectations'. It contains the following items: (3) *Everyone should be able to fall asleep as soon as their head hits the pillow;* (8) *Waking up during the night suggests a sleeping problem;* and (17) *Not getting enough sleep leads to a shorter life expectancy*

Factor 3 contains 3 items; this factor was named 'Sleep medication'. It contains the following items: (2) *Medication is probably the only solution to sleeplessness*; (4) *Sleeping pills prescribed is a safe and effective cure for chronic insomnia*; and (9) *Insomnia is essentially the result of a chemical imbalance, which sleeping tablets can fix.*

Factor 4 contains 4 items; this factor was named ‘Insomnia, health and behavioural issues’. It contains the following items: (7) *Chronic insomnia may have serious consequences on physical health;* (12) *Insomnia does not respond to therapies that aim to change behaviours;* (15) *If a person goes without sleep for 1-2 nights, they may have a "nervous breakdown";* and (18) *Faulty practices around sleep-wake behaviours can cause ongoing sleep problems.*

Factor 5 contains 2 items; this factor was named ‘High sleep expectations’. It contains the following items: (14) *A good night's sleep means sleeping like a log all night;* and (16) *Healthy sleep means falling asleep quickly.*

Table 3.1

Variable loadings on Factors (F) of the VOSS.

Factors and items	F 1	F 2	F 3	F 4	F 5
Amplification of the consequences of sleep					
(1) People need 8 hrs of sleep to feel refreshed & function well during the day	0.486				
(5) When people feel tired, no energy or not function well it is because they did not sleep well	0.652				
(6) Poor sleep can lead to greatly disturbed family/personal relationships	0.457				
(10) A poor night's sleep will interfere with activities the next day	0.703				
(11) Poor sleep leads to people becoming socially withdrawn	0.566				
(13) When people feel irritable, depressed, or anxious it is because they did not sleep well	0.462				
(19) Sleep problems are a major cause of life problems	0.555				
(20) Without an adequate night's sleep it is hard to function the next day.	0.767				
Exaggerated sleep expectations					
(3) Everyone should be able to fall asleep as soon as their head hits the pillow		0.684			
(8) Waking up during the night suggests a sleeping problem		0.550			
(17) Not getting enough sleep leads to a shorter life expectancy		0.506			
Sleep medication					
(2) Medication is probably the only solution to sleeplessness;			0.666		
(4) Sleeping pills prescribed is a safe and effective cure for chronic insomnia			0.746		
(9) Insomnia is essentially the result of a chemical imbalance, which sleeping tablets can fix			0.723		
Insomnia, health and behavioural issues					
(7) Chronic insomnia may have serious consequences on physical health				0.677	
(12) Insomnia does not respond to therapies that aim to change behaviours				0.533	
(15) If a person goes without sleep for 1-2 nights, they may have a "nervous breakdown"				0.363	
(18) Faulty practices around sleep-wake behaviours can cause ongoing sleep problems				0.721	
High sleep expectations					
(14) A good night's sleep means sleeping like a log all night					0.739
(16) Healthy sleep means falling asleep quickly					0.524

Table 3.2

Reliability coefficients of the VOSS factors

Factors	Reliability (Cronbach's α)
Amplification of the consequences of sleep	0.768
Exaggerated sleep expectations	0.467
Sleep medication	0.613
Insomnia, health and behavioural issues	0.622
High sleep expectations	0.513
Total scale (20 items)	0.792

3.1.3 Factor Analysis of the Sleep Beliefs Scale (SBS)

Data screening

Preliminary data screening revealed 8 outliers in the sample and these variables were deleted and replaced using the Estimated Means Method. There was less than 2.9% of missing data for individual variables and the Estimated Means Method was used to replace the missing data. A number of variables were positively or negatively skewed, however factor analysis is robust to the assumption of normality (Tabachnick & Fidell, 2007). Even though differences in skewness among variables may suggest curvilinearity, scatter and box plots were examined and revealed that many items were near normally or were normally distributed (i.e., showed no evidence of true curvilinearity). Furthermore, transformations are not considered favourable due to the goals of analysis (Tabachnick & Fidell, 2007). The other assumptions of this test were satisfied in that the sample size of 209 is considered "fair" for the principal components analysis method. Additionally, correlation matrixes were examined and multicollinearity and singularity were not present.

Factor analysis

A confirmatory factor analysis was conducted on the SBS to compare the three factors that the previous authors found (Adan et al., 2006). These factors were *Sleep incompatible behaviours* (items 1, 2, 7, 8, 11, 12, 14, 17), *Sleep–wake cycle behaviours*

(items 3–5, 10, 16, 19, 20) and *Thoughts and attitudes to sleep* (items 6, 9, 13, 15, 18). Adan et al, 2006 found that the percentage of variance explained by these factors was not high (35.33%), when tested on a sample of Psychology University students aged between 18 and 33.

In the current study, a confirmatory factor analysis was conducted with principal component analysis as the extraction method. In order to clarify the underlying structure of the data set, a varimax rotation method was used. Kaiser-Meyer-Olkin's measure of sampling adequacy was 0.70, indicating that the factor analysis should yield distinct and reliable factors. Bartlett's test of sphericity was significant (556.76 (190), p= 0.00) indicating that the correlation matrix was not an identity matrix, and that it was appropriate to proceed with the analysis. Three factors were extracted (based on the previous author's research, Adan et al., 2006). The three factors extracted accounted for 31.78% of the total sample variance. On examination of factor loadings the current study did not find similar factors to Adan et al., (2006). The factor loadings were unable to be distinguished based on the items that make up each factor (i.e. there was no clear theoretical grounds to distinguish each of Adan et al's., (2006) factors). Please refer to Table 3.3 for the SBS factor loadings for the current study. In this table the three factors identified by Adan et al., (2006) are indicated in the final column as A, B or C (as in the order of listed factors in the previous paragraph).

Table 3.3

Factor loadings (F) for each variable of the SBS as compared to Adan et al., (2006) factors where A= F 1, B= F 2, C= F 3(see text).

SBS Items	F 1	F 2	F 3	Adan et al., (2006) Factors
(2) Drinking coffee or other substances with caffeine after dinner	**0.632**			A
(10) Going to bed 2 hours later than the habitual hour	**0.585**			B
(14) Studying or working intensely until late at night	**0.539**		0.322	A
(7) Using sleep medication regularly	**0.479**			A
(9) Diverting one's attention and relaxing before bedtime	**0.433**			C
(19) Sleeping in a quiet and dark room	**0.429**			B
(11) Going to bed with an empty stomach	**0.419**			A
(16) Going to bed 2 hours earlier than the habitual hour		**0.677**		B
(13) Trying to fall asleep without feeling tired		**0.632**		C
(4) Taking a long nap during the day	0.403	**0.595**		B
(18) Being worried about the impossibility of getting enough sleep	0.418	**0.452**		C
(6) Thinking about one's engagements for the next day before falling asleep		**0.392**		C
(12) Using the bed for eating, calling on the phone, studying and other non-sleeping activities	0.359	**0.368**	0.348	A
(3) Doing intense physical exercise before going to bed		**0.364**		B
(8) Smoking before falling asleep			**0.672**	A
(20) Recovering lost sleep by sleeping for a long time			**0.609**	B
(1) Drinking alcohol in the evening			**0.496**	A
(5) Going to bed and waking up always at the same hour			**0.380**	B
(15) Getting up when it is difficult to fall asleep			**0.319**	C
(17) Going to bed immediately after eating			**0.311**	A

When the reliability of all the items was examined, using Cronbach's α coefficient, the internal reliability for the 20 items was good (α= 0.700). Table 3.4 lists the reliability

that each item adds to the total of all items (when one item is deleted), showing that each item is contributing to an overall measure of sleep hygiene knowledge.

Based on the major difference between the current study's factor analysis and that of Adan et al., (2006), it was decided that the SBS would be used for the current study in terms of collectively adding each item of the SBS (Sum Score) rather than any group differences being analysed in terms of factors. Lower scores indicate more incorrect beliefs/less sleep hygiene knowledge. As well, each individual item would be examined to see participant's knowledge on specific sleep hygiene items. Theoretically, a single summated SBS score is compatible with the content of the SBS, in that it is made up of items that collectively measure sleep hygiene practices (all activities that affect sleep) and this is confirmed by the high internal reliability (0.700) and the results shown in Table 3.4. This is consistent with research that argues that scales do not necessarily have to be fractioned into multiple subscales, rather recognising that measures are often saturated with common dimensions designed to measure a common theme (Reise, Waller & Comrey, 2000).

Table 3.4

SBS Reliability (Cronbach's α) for the 20-items when one item is deleted.

	SBS Items	α
1.	Drinking alcohol in the evening	0.700
2.	Drinking coffee or other substances with caffeine after dinner	0.683
3.	Doing intense physical exercise before going to bed	0.688
4.	Taking a long nap during the day	0.680
5.	Going to bed and waking up always at the same hour	0.695
6.	Thinking about one's engagements for the next day before falling asleep	0.690
7.	Using sleep medication regularly	0.689
8.	Smoking before falling asleep	0.683
9.	Diverting one's attention and relaxing before bedtime	0.691
10.	Going to bed 2 h later than the habitual hour	0.686
11.	Going to bed with an empty stomach	0.695
12.	Using the bed for eating, calling on the phone, studying and other non-sleeping activities	0.674
13.	Trying to fall asleep without feeling tired	0.700
14.	Studying or working intensely until late night	0.678
15.	Getting up when it is difficult to fall asleep	0.710
16.	Going to bed 2 h earlier than the habitual hour	0.688
17.	Going to bed immediately after eating	0.686
18.	Being worried about the impossibility of getting enough sleep	0.682
19.	Sleeping in a quiet and dark room	0.691
20.	Recovering lost sleep by sleeping for a long time	0.692

3.2 ***Phase Two: Differences between groups of different ages on the VOSS, SBS and Sleep Plot.***

3.2.1 Demographics and Descriptive Data

In Phase Two preliminary data screening revealed that there was missing data but the missing data accounted for less than 2.8% of the data. A summary of the age and sex details of participants of Phase Two of the study is presented in Table 3.5. Table 3.5 shows that the mean age difference between the two groups was just over 50 years, and that the two age groups had a similar bias to females.

Table 3.5

Descriptive statistics of the participants in Phase Two (number, Mean age, and Standard Deviation.

Age Group	*Gender*	*N*	*M*	*SD*
Younger adults (18-25 years old)	67 female 46 male	113	21.41	2.43
Older adults (60 years and older)	62 female 48 male	110	72.13	7.7

3.2.2 Views on Sleep Scale (VOSS)

Confirmatory Factor Analysis of the VOSS

A confirmatory factor analysis was run on the VOSS using a different population to Phase One. The factor analysis conducted was done with principal component analysis as the extraction method (using SPSS version 18). In order to clarify the underlying structure of the data set, a varimax rotation method was used. Five revised factors were chosen for extraction (based on Phase One of the current study) and criterion for significant correlation was set as .3 prior to analysis. This is a moderate loading and pure variables are considered to have loadings of .3 or greater on one factor (Coakes & Steed, 2007). Only one item was found to be complex. When complex factors were found the

variable was adapted to the factor of highest loading, unless otherwise specified. The five factors extracted accounted for 70.12% of the total sample variance and yielded a Cronbach's α of 0.917, showing very high internal reliability with the Phase Two sample (Please see Appendix I for more details of the confirmatory factor analysis).

Based on the major difference between the current factor analysis and that of Phase One, it was decided that the VOSS would be used for the current study in terms of collectively adding each item of the VOSS (Sum Score) so that lower scores indicate more dysfunctional beliefs and attitudes about sleep. As well, each individual item would be examined to see participant's level of dysfunctional belief and attitudes about sleep. Theoretically, a single summated VOSS score is compatible with the content of the VOSS, in that it is made up of items that collectively measure sleep and consequently people's extent of belief in these (sleep beliefs statements) and this is confirmed by the high internal reliability (0.917). This is consistent with research that argues that scales do not necessarily have to be fractioned into multiple subscales, rather recognising that measures are often saturated with common dimensions designed to measure a common theme (Reise et al., 2000).

When the reliability of all the items was examined, using Cronbach's α coefficient, the internal reliability for the 20 items was good (α= 0.917). Table 3.6 lists the reliability that each item adds to the total of all items (when one item is deleted), showing that each item is contributing to an overall measure of dysfunctional beliefs and attitudes about sleep.

Table 3.6

VOSS Reliability (Cronbach's α) for the 20-item scale when one item is deleted.

VOSS Items	α
1. People need 8 hours of sleep to feel refreshed and function well during the day	0.912
2. Medication is probably the only solution to sleeplessness	0.914
3. Everyone should be able to fall asleep as soon as their head hits the pillow	0.912
4. Sleeping pills prescribed these days are a safe and effective cure for chronic insomnia	0.918
5. When people feel tired, have no energy, or just seem not to function well during the day, it is generally because they did not sleep well the night before	0.912
6. Poor sleep can lead to greatly disturbed family/personal relationships	0.912
7. Chronic insomnia may have serious consequences on physical health	0.916
8. Waking up during the night suggests a sleeping problem	0.909
9. Insomnia is essentially the result of a chemical imbalance, which sleeping tablets can fix	0.915
10. A poor night's sleep will interfere with activities the next day	0.913
11. Poor sleep leads to people becoming socially withdrawn	0.911
12. Insomnia does not respond to therapies that aim to change behaviours	0.917
13. When people feel irritable, depressed, or anxious during the day, it is mostly because they did not sleep well the night before	0.909
14. A good night's sleep means sleeping like a log all night	0.910
15. If a person goes without sleep for 1 or 2 nights, they may have a "nervous breakdown"	0.908
16. Healthy sleep means falling asleep quickly	0.911
17. Not getting enough sleep leads to a shorter life expectancy	0.912
18. Faulty practices around sleep-wake behaviours can cause ongoing sleep problems	0.928
19. Sleep problems are a major cause of life problems	0.909
20. Without an adequate night's sleep it is hard to function the next day	0.912

Results pertaining to the hypothesised differences on the VOSS as a function of age group and gender are presented in the following section.

It is hypothesised that there will be a significant difference between the younger (18-25 years old) and older (60 years and older) adult groups on the VOSS scores. It is expected that the older adults will have lower VOSS scores, meaning they hold more dysfunctional beliefs and attitudes about sleep than the younger group. No differences across gender are expected.

Prior to analysis a total score for the VOSS was computed which was named the VOSS sum score (no items were required to be reversed). Missing data accounted for 2% of the data (acceptable amount) and was replaced using the Estimated Means Method.

Data screening revealed that the distribution of scores for the total score of the VOSS was slight negatively skewed but still normally distributed.

A two by two ANOVA was conducted to test whether the groups were significantly different on their VOSS total scores as a function of their age group and/or gender. The assumptions of an ANOVA were satisfied prior to the analysis (independence, normally distributed and homogeneity of variances). Results from the ANOVA revealed that there was a significant difference between age groups on the VOSS sum score (f (1) = 58.98, p= 0.00, effect size= 0.21). However, no significant difference was found on the VOSS sum score for gender (f (1) = 0.40, p= 0.52, effect size = 0.002). The analysis also found that there was not a significant gender by age group interaction on the VOSS sum score (f (1) = 0.67, p= 0.41, effect size = 0.003). Please refer to Table 3.7 for the means and standard deviations of each age group and gender for the VOSS sum score. The means show that the older adults have a lower average score on the VOSS reflecting they have more dysfunctional beliefs and attitudes about sleep than the younger adults.

Table 3.7

Descriptive results (mean, standard deviations) for both age groups and gender on the VOSS Sum Score (lower score indicates more dysfunctional beliefs).

	Male	Female	Total
Younger Adults (18-25 years)	62.02 (1.52) n= 46	59.98 (1.26) n= 67	60.81 (10.05) n= 113
Older Adults (60 years and older)	50.15 (1.49) n= 48	50.40 (1.30) n= 62	50.29 (10.50) n= 110
Total	55.95 (12.47) n= 94	55.37 (10.82) n= 129	55.62 (11.52) n= 223

Note: that for the 20 items the highest possible VOSS score is 100 (no dysfunctional beliefs and attitudes about sleep) and lowest possible score is 20 (dysfunctional beliefs and attitudes about sleep).

Due to a significant difference between the VOSS Sum score on age group, individual VOSS item scores were further analysed as a function of age. Prior to analysis data screening revealed that the individual VOSS scores (which varied from 1-5) ranged in skewness and distribution. Based on the differences in distribution (which is some cases indicated non-normality) a non parametric test was chosen, the Mann-Whitney U Test, to analyse the individual VOSS items. Results from the Mann-Whitney found that the two age groups (younger and older adults) were significantly different on all items of the VOSS, except for questions *(7) Chronic insomnia may have serious consequences on physical health, (12) Insomnia does not respond to therapies that aim to change behaviours, and (18) Faulty practices around sleep-wake behaviours can cause ongoing sleep problems.* Interestingly the questions with the lowest scores overall (based on the mean <2.30, indicating more dysfunctional beliefs and attitudes) were questions *(7) Chronic insomnia may have serious consequences on physical health, (10) A poor night's sleep will interfere with activities the next day, and (20) Without an adequate night's sleep it is hard to function the next day.* Please refer to Table 3.8 for a summary of the significance findings of the Mann-Whitney and descriptive statistics for each VOSS item.

Please note that values on the VOSS could range from 20 to 100. On individual questions of this scale values could range from 1 to 5. To truly reflect dysfunctional beliefs and attitudes about sleep mean individual scores that were below 2.3 (i.e. closer to 1) reflect that people were more likely to agree with the beliefs to a degree that was dysfunctional or over catastrophising the effects of poor sleep (strongly agree = 1, agree = 2, neither agree nor disagree = 3, disagree = 4 and strongly disagree = 5). This value was set arbitrarily due to reflecting a score closer to 1.

Table 3.8

*Descriptive statistics (with lower scores indicating more agreement and hence more dysfunctional beliefs) and summary of significance findings of the Mann-Whitney for each VOSS item as a function of age group. (*indicates a significant difference between age groups).*

VOSS item	Younger Mean (SD)	Older Mean (SD)	U	Z	p
1. *People need 8 hours of sleep to feel refreshed and function well during the day.	2.64 (1.23)	2.29 (1.16)	5273.5	-2.05	0.04
2. *Medication is probably the only solution to sleeplessness.	4.07 (0.79)	3.29 (0.80)	3237.5	-6.56	0.00
3. *Everyone should be able to fall asleep as soon as their head hits the pillow.	3.76 (0.93)	3.04 (0.88)	3761.5	-5.38	0.00
4. *Sleeping pills prescribed these days are a safe and effective cure for chronic insomnia.	3.19 (0.81)	2.69 (0.58)	4222	-4.66	0.00
5. *When people feel tired, have no energy, or just seem not to function well during the day, it is generally because they did not sleep well the night before.	2.47 (0.86)	1.60 (0.73)	2932	-7.27	0.00
6. *Poor sleep can lead to greatly disturbed family/personal relationships.	2.74 (0.98)	2.25 (0.72)	4482.5	-3.82	0.00
7. Chronic insomnia may have serious consequences on physical health.	1.94 (0.85)	1.88 (0.75)	6201	-0.03	0.97
8. *Waking up during the night suggests a sleeping problem.	3.44 (0.97)	2.79 (0.93)	3993.5	-4.83	0.00
9. *Insomnia is essentially the result of a chemical imbalance, which sleeping tablets can fix.	3.46 (0.74)	3.02 (0.65)	4348.5	-4.34	0.00
10. *A poor night's sleep will interfere with activities the next day.	2.08 (0.78)	1.73 (0.69)	4749.5	-3.4	0.001
11. *Poor sleep leads to people becoming socially withdrawn.	2.95 (1.03)	2.55 (0.74)	4629.5	-3.45	0.001
12. Insomnia does not respond to therapies that aim to change behaviours.	3.63 (0.78)	3.43 (0.70)	5476.5	-1.67	0.094
13. *When people feel irritable, depressed, or anxious during the day, it is mostly because they did not sleep well the night before.	3.26 (0.94)	2.31 (0.81)	2917.5	-7.00	0.00
14. *A good night's sleep means sleeping like a log all night.	3.27 (1.12)	2.49 (0.89)	3808	-5.30	0.00
15. *If a person goes without sleep for 1 or 2 nights, they may have a "nervous breakdown".	3.58 (1.14)	2.63 (1.23)	3656	-5.46	0.00
16. *Healthy sleep means falling asleep quickly.	3.46 (0.83)	2.92 (0.86)	4192	-4.49	0.00
17. *Not getting enough sleep leads to a shorter life expectancy.	3.16 (0.91)	2.49 (0.76)	3854	-5.18	0.00
18. Faulty practices around sleep-wake behaviours can cause ongoing sleep problems.	2.38 (0.72)	2.58 (0.65)	5369	-1.93	0.53
19. *Sleep problems are a major cause of life problems.	3.13 (1.07)	2.55 (0.85)	4385.5	-3.99	0.00
20. *Without an adequate night's sleep it is hard to function the next day.	2.20 (0.84)	1.64 (0.63)	3900.5	-5.37	0.00

Note: items on the VOSS were scored on a 5-point Likert scale (1= 'strongly agree', 2= 'agree', 3= 'neither agree nor disagree', 4= 'disagree', 5= 'strongly disagree').

3.2.3 Sleep Beliefs Scale (SBS)

It is hypothesised that there will be a significant difference between the younger (18-25 years old) and older (60 years and older) adult groups on the SBS scores. It is expected that the younger adults will have lower SBS scores, meaning they have less sleep hygiene knowledge than the older group. It is also hypothesised that males (both younger and older) will have less sleep hygiene knowledge than the females (both younger and older).

Initial data screening revealed that there was 4% missing data which was replaced using the Estimated Means Method. Furthermore questions 5, 9, 15, and 19 on the SBS were reversed scored to be consistent with the other questions on the scale (i.e. lower scores indicating more incorrect beliefs/less sleep hygiene knowledge). A SBS Sum Score was computed for analysis. The SBS Sum score was moderately negatively skewed, however it was normally distributed.

A two by two ANOVA was conducted to test whether the two groups were significantly different on their SBS scores as a function of their age group and gender. The assumptions of an ANOVA were satisfied prior to the analysis (independence, normally distributed and homogeneity of variances). Results from the ANOVA revealed that there was a significant difference between age groups on the SBS sum score (f (1) = 37.50, p= 0.00, effect size= 1.00). In addition to this there was a significant difference on the SBS sum score across gender (f (1) = 4.28, p= 0.04, effect size = 0.54). However the analysis found that there was not a significant gender by age group interaction on the SBS sum score (f (1) = 41.70, p= 0.15, effect size = 0.301). When examining the SBS score differences the means show that the younger adults and males had more incorrect beliefs/less sleep hygiene knowledge than the older adults and females (respectively). Table 3.9 presents the means and standard deviations of each age group and gender.

Due to a significant difference between the SBS Sum score for both age group and gender, individual scores on each SBS item were further analysed. Prior to analysis data screening revealed that the individual SBS scores (which varied from 1-3) ranged in

skewness and distribution. Based on these differences in distribution a non parametric test was chosen, Mann-Whitney U Test, to analyse the individual SBS items.

Table 3.9

Descriptive results (mean, standard deviations) for both age groups and gender on the SBS sum score. (A lower score indicates more incorrect beliefs/less sleep hygiene knowledge.)

	Male	Female	Total
Younger Adults	45.71 (4.71)	47.85 (5.28)	46.98 (5.14)
(18-25 years)	n= 46	n= 67	n= 113
Older Adults	50.31 (4.16)	50.69 (3.46)	50.52 (3.77)
(60 years and older)	n= 48	n= 62	n= 110
Total	48.06 (4.98)	49.21 (4.70)	48.73 (4.84)
	n= 94	n= 129	n= 223

Note: for the 20 items the highest possible SBS score is 60 (more sleep hygiene knowledge) and lowest possible score is 20 (less sleep hygiene knowledge).

Individual SBS items and Age

Results from the Mann-Whitney found that the two age groups (younger and older adults) were significantly different on some items of the SBS (questions 1, 5, 6, 8, 9, 10, 12, 13, 14, 16, 17, 18, 19, and 20). Table 3.11 shows the SBS questions along with descriptive and non-parametric statistics for both age groups (younger and older adults). The younger adults had lower scores on most (but not all) items on the SBS indicating they had less sleep hygiene knowledge than the older adults. However, interestingly the older adults had significantly less sleep hygiene knowledge on items *(1) Drinking alcohol in the evening,* and *(20) Recovering lost sleep by sleeping for a long time.* The questions with the lowest scores overall, based on the mean (indicating more dysfunctional beliefs and attitudes) were questions *(1) Drinking alcohol in the evening, (3) Doing intense physical exercise before going to bed, and (20) Recovering lost sleep by sleeping for a long time.* Please refer to Table 3.10 for a summary of the descriptive statistics for each SBS item as a function of age and findings of the Mann-Whitney U test.

Table 3.10

Descriptive statistics for each SBS item for both age groups (younger and older adults). (indicates a significant difference between age groups) (lower scores indicate more faulty sleep belief/less sleep hygiene knowledge)(R indicates scoring was reversed for these items)*

SBS item	Younger Mean (SD)	Older Mean (SD)	U	Z	p
1. *Drinking alcohol in the evening	1.96 (0.86)	1.58 (0.82)	4728	-3.37	0.00
2. Drinking coffee or other substances with caffeine after dinner	2.77 (0.46)	2.85 (0.36)	5838.5	-1.16	0.24
3. Doing intense physical exercise before going to bed	1.78 (0.87)	1.66 (0.80)	5822.5	-0.89	0.37
4. Taking a long nap during the day	2.65 (0.56)	2.66 (0.54)	6142	-0.18	0.85
5. *Going to bed and waking up always at the same hour (R)	2.37 (0.64)	2.73 (0.50)	4342	-4.52	0.00
6. *Thinking about one's engagements for the next day before falling asleep	2.46 (0.62)	2.88 (0.32)	3982.5	-5.82	0.00
7. Using sleep medication regularly	2.42 (0.65)	2.25 (0.72)	5495	-1.64	0.10
8. *Smoking before falling asleep	2.27 (0.61)	2.68 (0.46)	4057.5	-5.08	0.00
9. *Diverting one's attention and relaxing before bedtime (R)	2.72 (0.50)	2.89 (0.37)	5199	-3.19	0.00
10. *Going to bed 2 hours later than the habitual hour	2.29 (0.59)	2.74 (0.48)	3744.5	-5.86	0.00
11. Going to bed with an empty stomach	2.24 (0.69)	2.38 (0.79)	5400.5	-1.84	0.06
12. *Using the bed for eating, calling on the phone, studying and other non-sleeping activities	2.36 (0.55)	2.86 (0.34)	3292.5	-7.21	0.00
13. *Trying to fall asleep without feeling tired	2.33 (0.52)	2.63 (0.52)	4418	-4.26	0.00
14. *Studying or working intensely until late at night	2.41 (0.74)	2.83 (0.46)	4285	-5.02	0.00
15. Getting up when it is difficult to fall asleep (R)	2.15 (0.71)	2.29 (0.81)	5465.5	-1.67	0.09
16. *Going to bed 2 hours earlier than the habitual hour	2.07 (0.57)	2.39 (0.73)	4484	-3.95	0.00
17. *Going to bed immediately after eating	2.49 (0.61)	2.87 (0.38)	4097	-5.60	0.00
18. *Being worried about the impossibility of getting enough sleep	2.71 (0.49)	2.93 (0.26)	4954	-3.97	0.00
19. *Sleeping in a quiet and dark room(R)	2.74 (0.43)	2.89 (0.31)	5298	-2.83	0.00
20. *Recovering lost sleep by sleeping for a long time	1.81 (0.74)	1.53 (0.63)	4971	-2.83	0.00

Note: items on the SBS were scored on a 3-point Likert scale (1= 'positive effect', 2= 'neither effect', 3= 'negative effect', SD= Standard Deviation.

Please note that values on the SBS could range from 20 to 60. On individual questions of this scale values could range from 1 to 3. To truly reflect poor sleep hygiene knowledge mean individual scores that were below 2 (i.e. closer to 1) reflect that people were more likely to incorrectly agree that behaviours had a positive effect on sleep (1 = 'positive effect', 2 = 'neither effect', 3 = 'negative effect').

Individual SBS items and Gender

Results from the Mann-Whitney found that gender was significantly different on only a few items of the SBS (questions 10, 14, and 17) and were not significant on the remainder of the questions. On the items with a significant difference on gender, the males had lower scores indicating they had less knowledge about sleep hygiene/ faulty sleep beliefs. The items showing a significant gender difference were *(10) Going to bed 2 hours later than the habitual hour, (14) Studying or working intensely until late at night and (17) Going to bed immediately after eating*. Please refer to Table 3.11 for a summary of the Mann Whitney U test findings and descriptive statistics for each significant SBS item on gender.

Table 3.11

Descriptive statistics for each SBS item for both genders (females and males). (indicates a significant difference between females and males) (lower scores indicate more faulty sleep belief/less sleep hygiene knowledge)(R indicates scoring was reversed for these items)*

SBS item	Female Mean (SD)	Male Mean (SD)	U	Z	p
1. Drinking alcohol in the evening	1.76 (0.89)	1.79 (0.81)	5852.5	-0.48	0.62
2. Drinking coffee or other substances with caffeine after dinner	2.83 (0.41)	2.78 (0.41)	5669.5	-1.23	0.21
3. Doing intense physical exercise before going to bed	1.74 (0.87)	1.69 (0.79)	5966.5	-0.22	0.82
4. Taking a long nap during the day	2.67 (0.56)	2.63 (0.54)	5733	-0.86	0.38
5. Going to bed and waking up always at the same hour (R)	2.52 (0.65)	2.59 (0.53)	5900	-0.39	0.69
6. Thinking about one's engagements for the next day before falling asleep	2.69 (0.55)	2.64 (0.52)	5659	-1.06	0.28
7. Using sleep medication regularly	2.35 (0.73)	2.32 (0.62)	5763	-0.69	0.48
8. Smoking before falling asleep	2.52 (0.61)	2.41 (0.53)	5340.5	-1.72	0.08
9. Diverting one's attention and relaxing before bedtime (R)	2.81 (0.48)	2.79 (0.41)	5716	-1.10	0.26
10. *Going to bed 2 hours later than the habitual hour	2.59 (0.59)	2.40 (0.55)	4923	-2.74	0.00
11. Going to bed with an empty stomach	2.29 (0.78)	2.34 (0.69)	5932	-0.30	0.76
12. Using the bed for eating, calling on the phone, studying and other non-sleeping activities	2.65 (0.51)	2.55 (0.54)	5501	-1.40	0.16
13. Trying to fall asleep without feeling tired	2.50 (0.56)	2.45 (0.52)	5712	-0.84	0.39
14. *Studying or working intensely until late at night	2.71 (0.60)	2.48 (0.69)	4922.5	-3.00	0.00
15. Getting up when it is difficult to fall asleep (R)	2.22 (0.78)	2.22 (0.75)	6059.5	-0.00	0.99
16. Going to bed 2 hours earlier than the habitual hour	2.24 (0.72)	2.21 (0.60)	5815.5	-0.57	0.56
17. *Going to bed immediately after eating	2.74 (0.52)	2.60 (0.57)	5260	-2.15	0.03
18. Being worried about the impossibility of getting enough sleep	2.85 (0.37)	2.77 (0.45)	5556	-1.61	0.10
19. Sleeping in a quiet and dark room(R)	2.84 (0.37)	2.79 (0.41)	5760	-0.94	0.34
20. Recovering lost sleep by sleeping for a long time	1.70 (0.73)	1.63 (0.65)	5830.5	-0.53	0.59

Note: items on the SBS were scored on a 3-point Likert scale (1= 'positive effect', 2= 'neither effect', 3= 'negative effect', SD= Standard Deviation.

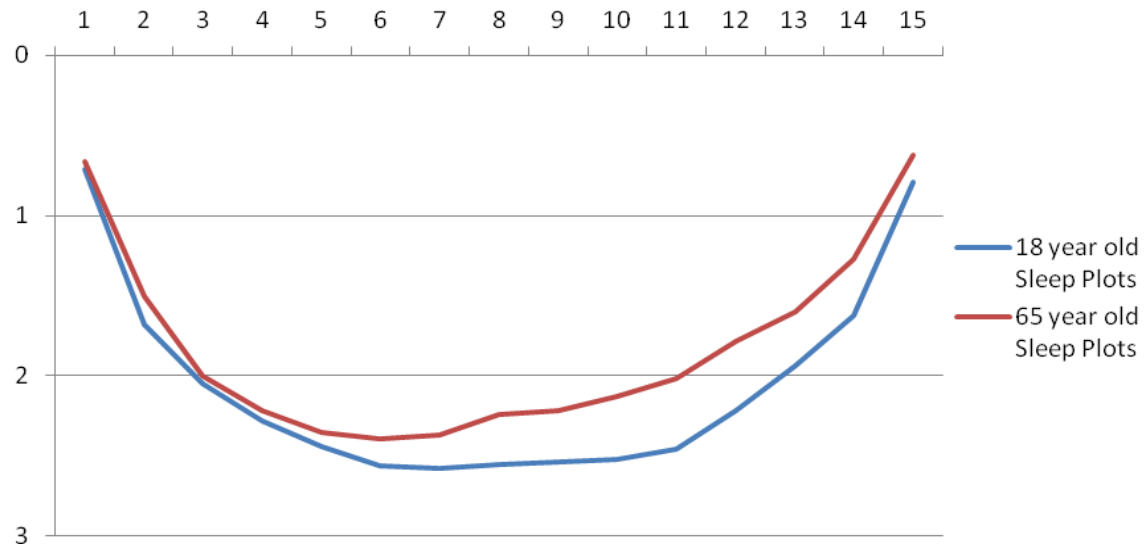
3.2.4 Sleep Plot

Scoring of the Sleep Plot was adapted from Lack (2007) (see Method section for more information on scoring). The dependent variables for the following analyses were the individual ratings of the depth of sleep for each of the 15 time points within each Plot.

Prior to analysis data screening revealed that there was 2.7% of missing data which was deemed acceptable and data analysis could continue. Further inspection of the Plots and normality tests found the data was normally distributed. The following sections of the Sleep Plot are divided into research questions. Please note that when the word respondents is used this means, younger respondents are 18-25 year olds, and older respondents are 60 years and older. There were 7 hypotheses related to the Sleep Plot these are addressed below:

1. *Are the Sleep Plots of the 18 versus 65 year olds significantly different?*

A repeated measures MANOVA (assumptions were met: normality, homogeneity of variances, and sphericity) was used to explore whether the Plots depicting the sleep of an 18 year old and a 65 year old were different across the 15 time point ratings (combining the data of the younger and older age groups). The results revealed that there was a significant difference between the 18 year old and 65 year old Plots, (f (14, 203) = 140.26, p= 0.00). Also, significant univariate results were found across the ratings. Please refer to Figure 3.1 for the time interval ratings for each Plot. The graph shows that the 18 year old Sleep Plots show deeper sleep (higher mean) than the 65 year old Sleep Plots. (Please see Appendix J for the descriptive statistics for the time interval ratings for each Plot).



Note: the Sleep Plots were scored on 3 points across 15 time intervals (0= awake, 1= light sleep, 2= deep sleep, 3= very deep sleep).

Figure 3.1 The 18 and 65 year old Sleep Plots.

2. *Are the combined Sleep Plots (of the 18 and 65 year olds) significantly different as a function of the age and gender of the respondent (younger versus older adult groups, males versus females)?*

A two-way MANOVA (assumptions were met: normality, homogeneity, independence) was used to determine whether the Sleep Plots (combined: both 18 and 65 year old Plots) differed as a function of the age and gender of the respondent (younger versus older adult groups). The results of the two-way MANOVA (age and gender) found that the Sleep Plots did not differ as a function of the age (f (30, 184) = 1.35, p= 0.11) or gender (f (30, 184) = 1.17, p= 0.26) of the respondent.

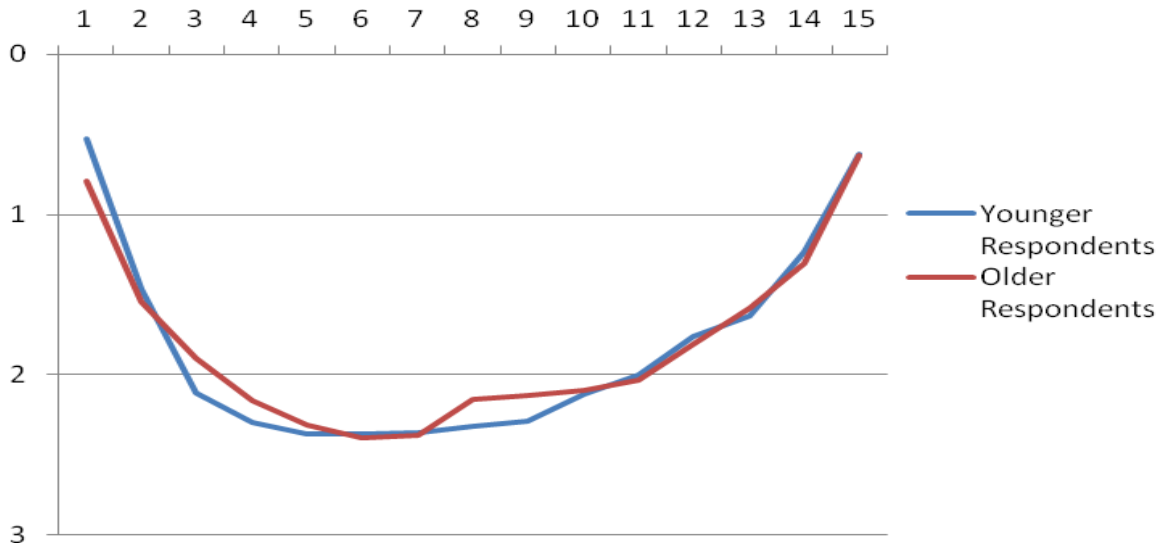
3. *Are the 18 year old Sleep Plots significantly different based on the age and gender of the respondent?*

A two-way MANOVA (assumptions were met: normality, homogeneity, independence) was used to determine whether the 18 yr old Sleep Plots differed as a function of the age and gender of the respondent (younger and older adult groups). The results of the two-way MANOVA (age and gender) found that the 18 year old Sleep Plots did not differ as

a function of the age (f (15,199) = 1.44, p = 0.13) or gender (f (15,199) = 1.52, p = 0.10) of the respondent.

4. *Are the 65 year old Sleep Plots significantly different based on the age and gender of the respondent?*

A two-way MANOVA (assumptions were met: normality, homogeneity, independence) was used to uncover whether the 65 year old Sleep Plots differed as a function of the age and gender of the respondent (younger and older adult groups). The results of the two-way MANOVA (age and gender) found that the 65 year old Sleep Plots did differ as a function of the age (f (15,199) = 1.80, p = 0.03) of the respondent but not the gender (f (15,199) = 1.15, p = 0.31) of the respondent. However, significant univariate results were not found across the ratings (except on Rating 1). Please refer to Figure 3.2 which shows that the younger respondents plotted the 65 year old Sleep Plot to have deeper and more uninterrupted sleep than the older respondents (please see Appendix J for descriptive statistics).

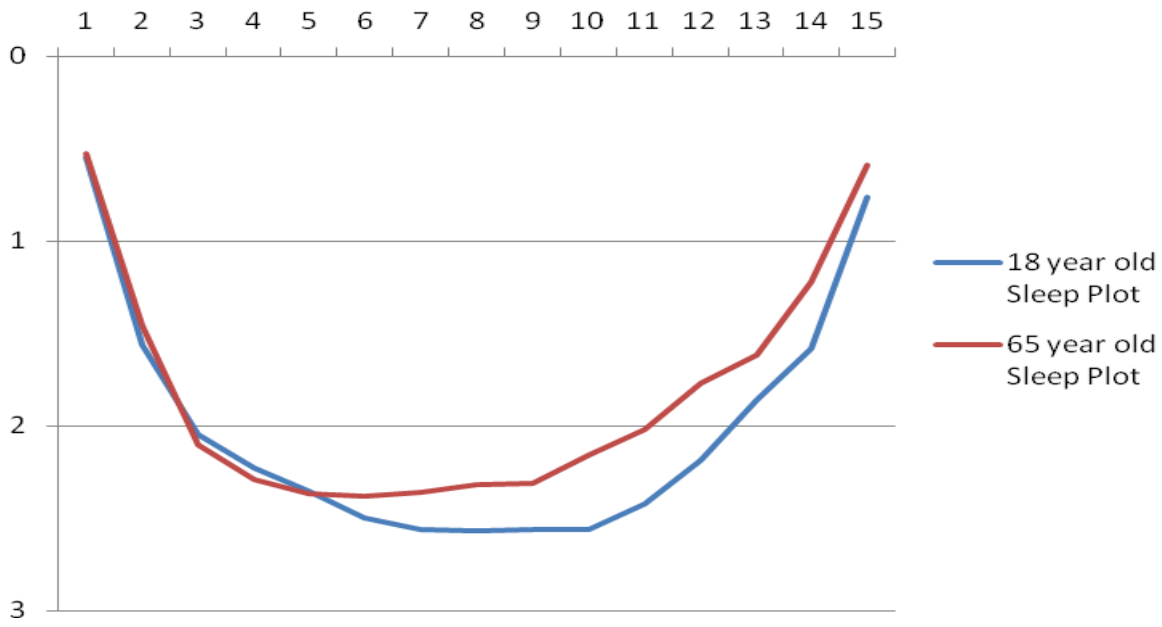


Note: the Sleep Plots were scored on 3 points across 15 time intervals (0= awake, 1= light sleep, 2= deep sleep, 3= very deep sleep).

Figure 3.2 The 65 year old Sleep Plot, as rated by both age groups.

5. *Is there a significant difference in how the younger respondents (18 to 25 years old) plotted the sleep of the 18 versus 65 year old Sleep Plots?*

A repeated measures MANOVA (assumptions were met: normality, homogeneity of variances, and sphericity) was used to examine whether the younger respondents plotted the 18 and 65 year old Sleep Plots differently. The results show that the younger respondents did plot the 18 and 65 year old Sleep Plots differently (f (14, 94) = 71.11, p = 0.00). Also, significant univariate results were found across the ratings. Please refer to Figure 3.3 which shows that the younger respondents plotted deeper sleep on the 18 year old Sleep Plot and lighter sleep for 65 year old Sleep Plot (as evident in a higher mean) (please see Appendix J for descriptive statistics).

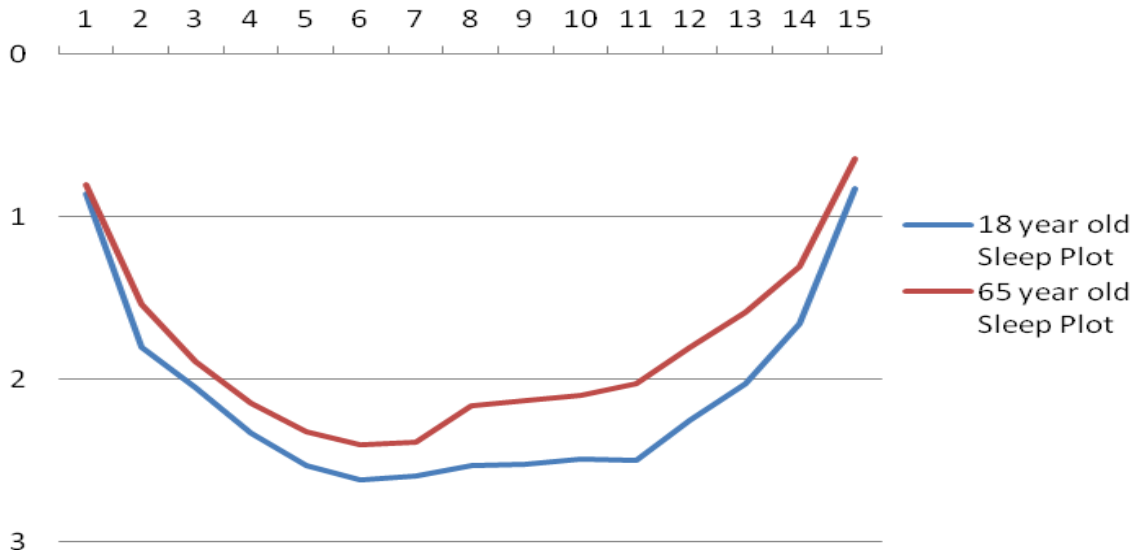


Note: the Sleep Plots were scored on 3 points across 15 time intervals (0= awake, 1= light sleep, 2= deep sleep, 3= very deep sleep).

Figure 3.3 How the younger respondents plotted the sleep of the 18 and 60 years Sleep Plots.

6. *Is there a significant difference in how the older respondents (60 years and older) plotted the sleep of the 18 versus 65 year old Sleep Plots?*

A repeated measures MANOVA (assumptions were met: normality, homogeneity of variances, and sphericity) was used to examined whether the older respondents plotted that 18 year old and 65 year old adults sleep differently. The results show that the older respondents did plot the 18 and 65 year old Sleep Plots significantly differently (f (14, 95) = 75.85, p= 0.00). Also, significant univariate results were found across the ratings. Please refer to Figure 3.4 which shows that the older respondents plotted deeper sleep on the 18 year old Sleep Plots and lighter sleep on the 65 year old Sleep Plots (as evident in a higher mean) (please see Appendix J for descriptive statistics).



Note: the Sleep Plots were scored on 3 points across 15 time intervals (0= awake, 1= light sleep, 2= deep sleep, 3= very deep sleep).

Figure 3.4 How the older respondents plotted the sleep of the 18 and 65 years Sleep Plots.

7. *It is hypothesised that both age groups will provide plots of unrealistically "deep" and uninterrupted sleep across the night for both the 18 and 65 year old Sleep Plots.*

Qualitative analysis of the plots showed that both age groups provided a Sleep Plot of uninterrupted and deep sleep across the night. Many of the Sleep Plots followed a pattern of light sleep at the beginning of the night going into deeper sleep across the night and then finally coming into lighter sleep until awakening in the morning (see

Figures 3.1 -3.4 above). The majority of the Sleep Plots were an inverted bell shaped curve and few Plots depicted light sleep or awakenings during the night's sleep (unless the sleeper had just gone to sleep or come out of sleep in the morning) (see example in Appendix K for an example of a common response).

Below is an example of a typical night sleep for a young adult. However, it is important to note this graph has different time intervals across the x axis to the graphs above.

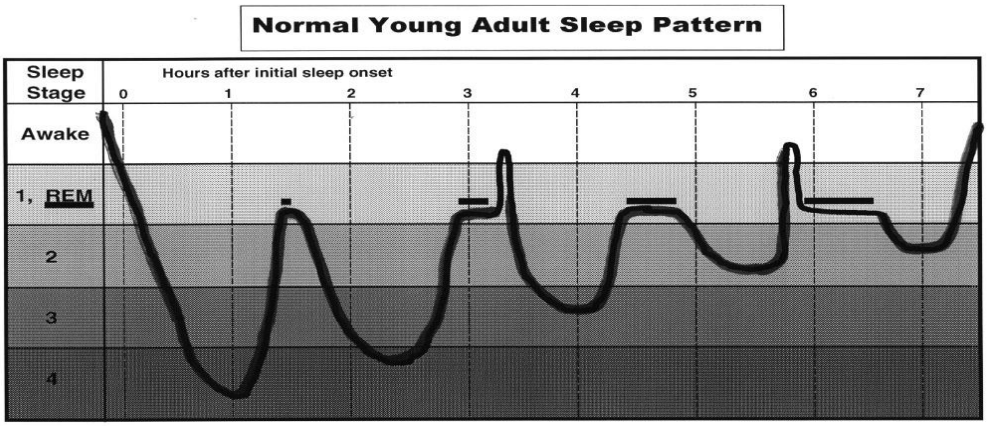


Figure 3.5 An example of a typical night sleep for a young adult.

3.3 Summary of significant findings

3.3.1 Psychometric properties of two scales.

- In Phase One, an exploratory factor analysis found 5 factors of the VOSS these were: 'Amplification of the consequences of sleep'; 'Exaggerated sleep expectations'; 'Sleep medication'; 'Insomnia, health and behavioural issues'; and 'High sleep expectations'. The internal reliability of each factor was good, and the reliability of all the items overall was good (α= 0.792).

- In Phase Two, a confirmatory factor analysis on the VOSS yielded 5 different factors to Phase One. Due to this, the VOSS would be used for the current study in terms of collectively adding each item of the VOSS (Sum Score) so that lower scores indicate more dysfunctional beliefs and attitudes about sleep. This scale showed high internal reliability (0.917).

- A confirmatory factor analysis on the SBS revealed that the 3 factors found were not similar to that of the authors Adan et al., (2006). There was no clear theoretical grounds to distinguish each of Adan et al's., (2006) factors. Based on the major difference between the current study's factor analysis and that of Adan et al., (2006), it was decided that the SBS would be used for the current study in terms of collectively adding each item of the SBS (Sum Score) so that lower scores indicate more incorrect beliefs/less sleep hygiene knowledge. The scale showed good internal reliability (0.700).

3.3.2 Differences between groups of different ages on the VOSS, SBS and Sleep Plot.

- On the VOSS there was a significant difference between the younger and older age groups on their total VOSS score (no gender differences). Older adults had more dysfunctional beliefs and attitudes about sleep than the younger adults. Most items were significantly different across age groups.

- On the SBS a significant difference was found between SBS scores and age group and gender. When examining the SBS score differences the means show that the younger adults and males had more incorrect beliefs/less sleep hygiene knowledge than the older adults and females (respectively).
- The younger adults overall have lower scores on the SBS, indicating they have less sleep hygiene knowledge/ faulty sleep beliefs than the older adults. However, interestingly the older adults have significantly less sleep hygiene knowledge on items *(1) Drinking alcohol in the evening,* and *(20) Recovering lost sleep by sleeping for a long time.*
- The questions of the SBS with the lowest scores overall, based on the mean (indicating more dysfunctional beliefs and attitudes) were questions *(1) Drinking alcohol in the evening, (3) Doing intense physical exercise before going to bed, and (20) Recovering lost sleep by sleeping for a long time.*
- In terms of the Sleep Plot, the 18 year old Sleep Plots showed significantly deeper sleep than the 65 year old Sleep Plots. Overall the Sleep Plots (combined) did not differ as a function of the age of the respondent.
- When each different Sleep Plot was examined it was found that the 18 year old Sleep Plots did not differ as a function of the age of the respondent. Whereas the 65

year old Sleep Plots did differ as a function of the age of the respondent, with the younger respondents plotting 65 year olds as having deeper sleep.

- When the age of the respondents was examined it was found that both age groups plotted that the 18 year old Sleep Plot has deeper sleep than the 65 year old Sleep Plot.
- Qualitative analysis of the plots showed that both age groups provided a Sleep Plot of uninterrupted and deep sleep across the night, with the majority of plots shown as an inverted bell shaped curve.
- No gender effects were found in any of the above Sleep Plot analyses.

Chapter 4: Discussion

The discussion of Phase One, the scales used in the study, is presented into section 4.1. The Phase Two discussion of hypotheses and findings are organised into three parts within section 4.2 for clarity, that is; 1. The VOSS 2. The SBS 3. The Sleep Plot. Limitations and directions for future research and conclusions are discussed in sections 4.3 and 4.4 respectively.

4.1 Phase One: scales

4.1.1 Views on Sleep Scale (VOSS)

The VOSS was a newly developed scale to test participant's dysfunctional beliefs and attitudes about sleep (in general, not their own sleep). In Phase One an exploratory factor analysis revealed that five factors were yielded which showed good, average and poor internal consistency (Amplification of the consequences of sleep= 0.768; Exaggerated Sleep Expectations= 0.467; Sleep Medication= 0.613; Insomnia, health and behavioural issues= 0.622; and High Sleep Expectations= 0.513). The factor structure from the VOSS differed to the Dysfunctional Beliefs and Attitudes about Sleep scale (DBAS). The DBAS comprises the following factors and their reliability: (a) Misattributions or amplification of the consequences of insomnia (0.77), (b) Diminished perception of control and predictability of sleep (0.68), (c) Unrealistic sleep expectations (-0.09), (d) Misconceptions about the causes of insomnia (0.31), and (e) Faulty beliefs about sleep-promoting practices (0.56). Morin et al., (1993) reported that some low coefficients were found on the DBAS due to the small number of items on these subscales (i.e. factor d had 2 items). This is similar to the factor of the VOSS ('Exaggerated Sleep Expectations', 3 items and 'High Sleep Expectations', 2 items) which yielded the lowest internal reliability, possibly due to the smaller number of items that made up these factors. The similarities between the VOSS and DBAS are mainly on the factor 'Amplification of the consequence of insomnia'. Given that many questions of the VOSS were derived from the DBAS (re-worded to be about people's perception on sleep in general) similarities were expected. The differences in factor structure on the VOSS are possibly due to only some items of the DBAS being used, as well as other questions added (from other sources and from the researcher). Overall, the VOSS shows promising psychometric properties with overall higher reliability for the

factors than the DBAS. As there is little psychometric information about the Sleep Beliefs Questionnaire (SBQ), similar comparisons between the VOSS (which included some SBQ questions) and the SBQ are not possible. The SBQ is similar to the VOSS in its aim to measure potential effects of disturbed sleep on life across the following four categories: quality of life, loss of control, expected or standard effects, and social impact. Again, similar to the VOSS the SBQ asks participants to think about people's sleep in general rather than their own personal effects of poor sleep. Future research re-testing the VOSS and its factor structure would assist in making this scale valid for use in the general community when assessing dysfunctional beliefs and attitudes about sleep.

Using a different sample a confirmatory factor analysis was run on the VOSS in Phase Two to explore whether the factors in Phase One continued to fit the data set. The confirmatory factor analysis in Phase Two failed to yield the same factors as Phase One. In the literature for developing measurement scales, exploratory and confirmatory factor analyses are two common statistical tools used. An exploratory factor analysis was used in Phase One as it is widely reported for use in initial scale development and evaluation. This statistical method allows for loadings to vary freely and assesses which items should be grouped together (Reise, Waller & Comrey, 2000). The use of a confirmatory factor analysis in Phase 2, using a different sample, was consistent with the recommendations of numerous researchers and statisticians recommending its use in scale development to confirm previous factors found (Costello & Osborne, 2005; Hurley et al., 1997). Confirmatory factor analysis tests specific hypotheses and these were developed in Phase One of the current study. In the current study the confirmatory factor analysis did not confirm the factors found in the VOSS exploratory factor analysis from Phase One. This finding is unexpected and there are limited theoretical or other reasons to understand why this may have been the case. An important explanation of why the factor analysis was not confirmed may be the sample size of the current study (which was 223). Some research has stated that a sample size of 300 for a factor analysis is only 'adequate' and the larger the sample size the more chance the results will be confirmed and reflect the true sample (Wilson VanVoorhis & Morgan, 2007). Another possible explanations may be the differences in the population samples, given that Phase One consisted of participants of varying adult ages compared to Phase Two which consisted of participants who were either younger or older adults. Despite this

difference, there are no theoretical arguments to suggest why this would lead the confirmatory factor analysis to yield such different factors.

As a result of these findings, closer inspection of the tools used found that confirmatory factor analysis has been reported by some as controversial and will often not yield the same factors as an exploratory factor analysis (Hurley et al., 1997). Some research suggests that this may be due to confirmatory factor analysis being too restrictive to expect a good fit in the data (Hurley et al., 1997). This may be due to the constraints of a confirmatory factor analysis, in which it constrains loadings to zero and only allows item loadings on a main factor to vary. To overcome the limitations of a confirmatory factor analysis more recent literature suggests that Structural Equation Modelling may be a more appropriate method for validating the factors in an exploratory factor analysis (Hoe, 2008). In comparison to confirmatory factor analysis, Structural Equation Modelling extends the possibility of relationships among the latent variables and encompasses two components, the measurement model and the structural model (Schreiber, Nora, Stage, Barlow & King, 2006). It would be interesting to conduct such analyses of the VOSS in subsequent research to determine whether the VOSS can reliably yield factors that can be used for comparative analyses across groups (for example, age and gender or clinical and non clinical populations).

In the current study the psychometric properties obtained for the VOSS suggest that this instrument is effective and reliable when assessing a total score of dysfunctional beliefs and attitudes about sleep (Cronbach's $\alpha = 0.917$). Further, reliability analyses of individual questions that make up this 20 item scale indicate they are all contributing to the measurement of dysfunctional beliefs and attitudes about sleep (ranging from 0.908 to 0.928). Thus, as a measure of community beliefs and attitudes about sleep, Phase One of the current study indicates that the use of the VOSS for comparing differences across groups using the total score and analyses of individual items was appropriate.

4.1.2 Sleep Beliefs Scale (SBS)

The confirmatory factor analysis of the SBS (a questionnaire of sleep hygiene knowledge) in the current study failed to yield the same factors as reported originally by the creators of the scale (Adan et al., 2006). There are a few possible reasons to account

for this difference. Firstly, Adan et al., (2006) tested the scale on undergraduate psychology students (aged 18 to 33 years), whereas Phase One of the current study used this scale on adults aged 18 to 86 years. Secondly, Adan et al., (2006) found that the three factors of the SBS only accounted for 35.33% of the total sample variance, and a similar low value was found with the current confirmatory factor analysis. Lastly, the issues and controversies of using confirmatory factor analysis, as described in the section above, are likely to be important here as well. It is also important to note that sleep hygiene scales commonly have lower psychometric properties than other sleep related scales (Bauermann, Parker, & Smith, 2000; Gallasch & Gradisar, 2007). Therefore the finding of low psychometric properties for the sleep hygiene scale is not confined to this study.

However in the current study the psychometric properties obtained for the SBS suggest that this instrument is effective and reliable when using a total score of sleep hygiene knowledge (Cronbach's $\alpha = 0.700$). Further, reliability analyses of individual questions that make up this scale indicate they are all contributing to the measurement of sleep hygiene knowledge (ranging from 0.674 to 0.710). Other sleep hygiene scales typically consist of factors that account for the variance in the scales. Therefore, further research would be of interest to determine whether the SBS can reliably yield factors that can be used for comparative analyses across groups (for example, age and gender or clinical and non-clinical populations).

Although the SBS was named The Sleep Beliefs Scale, it is suggested that this scale be renamed to indicate that it is essentially about sleep hygiene knowledge. Sleep beliefs is a much broader concept than sleep hygiene, with 'beliefs' including the themes assessed in the DBAS and VOSS. In contrast, the SBS focuses on a participant's understandings of what behaviours will have a positive or negative effect on sleep quality.

4.2 Phase Two: Hypothesis Testing

4.2.1 Views On Sleep Scale (VOSS)

The effects of age

The VOSS measured dysfunctional beliefs and attitudes about sleep. As hypothesised, there was a significant difference between the younger (18-25 years old) and older (60 years and older) adult groups on their VOSS scores. The older adults had lower VOSS scores, meaning they held more dysfunctional beliefs and attitudes about sleep than the younger adults. This finding is consistent with much research demonstrating the role of dysfunctional beliefs and attitudes about sleep in older adults, particularly in poor sleepers (Carney et al., 2007; Morin & Gramling, 1989). However, given the current study did not distinguish between good and poor sleepers but rather used people from the general community, current findings indicate that dysfunctional beliefs and attitudes about sleep are not restricted to those with a diagnosed or self reported sleeping problem. This is similar to research that was unable to distinguish good and poor sleepers on their dysfunctional beliefs and attitudes about sleep (Voinescu et al., 2010; Ellis et al., 2007).

When individual VOSS questions were examined across age the analysis revealed that the older adults held significantly more dysfunctional beliefs and attitudes about sleep than the younger adults on 17 items of the VOSS (see Results section, Table 3.8, for all 17 items). In particular, older people agree with more statements about how bad a poor night's sleep is on functioning the next day. There are a few possible reasons to account for this finding, including: (i) As older adults get less deep sleep they may be more likely to be concerned about the effects of poor sleep on their functioning. Older adults in general experience less time in stages 3 and 4 sleep (deep sleep) and REM sleep compared to younger adults (Ohayon et al., 2004; Monjan, 2010). In addition to this, older adults have a greater rate of sleep disturbances than younger adults (Ohayon et al., 2004). Older adults have more experience with sleep disturbances and due to their age experience these disturbances for a longer period of time than younger adults. Based on this, this may increase their likelihood to develop more beliefs about sleep than younger adults. Also, given that many changes occur in older adults (deep sleep decreases, lifestyle changes, physical health and mental health issues) that impact their sleep, they may have a higher propensity to overestimate these changes and their effect on sleep (Morin et al., 1993; McCurry, Logsdon, Teri & Vitiello, 2007). Previously this was thought to have more of an impact for those with insomnia, however as all older adults in the general community experience these changes a larger proportion of older adults

may experience concerns regarding sleep and its consequences. Another possible explanation of these findings suggests that (ii) younger people are, in general, better able to cope with the effects of sleep deprivation than older people. Research has found that aging influences a person's ability to cope with sleep deprivation, with older people experiencing more impairment in attention, working memory, long-term memory, decision making, and other functions after sleep deprivation (Webb, 1985; Aloha & Polo-Kantola, 2007).

The older adults had low mean scores, indicating they held the most dysfunctional beliefs and attitudes about the following questions: *(1) People need 8 hours of sleep to feel refreshed and function well during the day; (5) When people feel tired, have no energy, or just seem not to function well during the day, it is generally because they did not sleep well the night before; (6) Poor sleep can lead to greatly disturbed family/personal relationships; (7) Chronic insomnia may have serious consequences on physical health; (10) A poor night's sleep will interfere with activities the next day;* and *(20) Without an adequate night's sleep it is hard to function the next day*. These findings highlight that the following beliefs would be of importance to focus on in the education and/or treatment of older adults in the general community.

The younger adults also held the most dysfunctional beliefs and attitudes about the following questions: *(7) Chronic insomnia may have serious consequences on physical health; (10) A poor night's sleep will interfere with activities the next day;* and *(20) Without an adequate night's sleep it is hard to function the next day.* As the younger adults are similar to older adults on these questions, this suggests that both age groups are over catastrophising some of the effects of poor sleep on day time functioning. These findings indicate that widespread education concerning these beliefs would not only benefit older adults but also younger adults.

There were no significant differences between the younger and older adults on item *(7) Chronic insomnia may have serious consequences on physical health*) and the mean indicates some agreement (1.94, where 2 = agree). Both age groups may have indicated agreement on this question due to the way it was worded with 'may' have serious consequences on physical health. Additionally, some research suggests that this statement may be quite valid and not a 'dysfunctional' belief at all. There is increasing

evidence that sleep deprivation has detrimental effects on the immune response, indicating that sleep plays a vital role in immune functioning and thus may have consequences on physical health (Bryant, Trinder & Curtis, 2004; Orzel-Gryglewska, 2010). In addition, no significant difference was found between age groups on items: *(12) Insomnia does not respond to therapies that aim to change behaviours,* and *(18) Faulty practices around sleep-wake behaviours can cause ongoing sleep problems.* On question 12 the mean scores indicate that both age groups appear to acknowledge that insomnia does respond to behavioural therapy and behaviour change. On question 18, both age groups appear ambivalent (neither agree nor disagree) that faulty practices around sleep-wake behaviours can cause ongoing sleep problems. Furthermore, both age groups disagreed that, *(2) Medication is probably the only solution to sleeplessness* (older adults M = 3.29, younger adults M = 4.07). This result indicates that participants are aware that there are other treatment options to sleeping problems other than medication. Thus for the three items where the older adults did not differ from the younger adults it can be argued from the mean scores that neither group's views were indicative of 'dysfunctional' views.

The effects of gender

As predicted, the current study found no significant differences on the VOSS for gender. This finding suggests that both males and females are comparable in their beliefs and attitudes about sleep. This finding is consistent with research which found on dysfunctional beliefs and attitudes, older good and poor sleepers did not significantly differ between genders. Limited research is available to specifically compare both genders (of younger and older adults) on dysfunctional beliefs and attitudes about sleep. Future research would be of interest to replicate these results that dysfunctional beliefs and attitudes about sleep are comparable across gender.

Summary and Conclusions

No published research has compared dysfunctional beliefs and attitudes about sleep from a developmental perspective. Therefore these results using the VOSS, showing that older adults have more dysfunctional beliefs and attitudes about sleep than younger adults, are of considerable interest. Much research has shown that that a variety of faulty beliefs, expectations, and attributions are instrumental in heightening emotional arousal

and in exacerbating sleep disturbances (Morin, 1993; Morin et al, 2002). As research suggests that dysfunctional beliefs and attitudes about sleep can perpetuate sleep problems and make them worse, early and preventive education about sleep would benefit the whole community.

In summary the following dysfunctional beliefs would be of benefit to educate older adults in the general community:

- People need 8 hours of sleep to feel refreshed and function well during the day
- When people feel tired, have no energy, or just seem not to function well during the day, it is generally because they did not sleep well the night before
- Poor sleep can lead to greatly disturbed family/personal relationships.

Also education for both age groups on the following dysfunctional beliefs about sleep would be of benefit:

- Chronic insomnia may have serious consequences on physical health
- A poor night's sleep will interfere with activities the next day
- Without an adequate night's sleep it is hard to function the next day

Public education on these items could be done through more publicity on some of these key messages, such as:

- Sleep is individual and varied
- There can be many reasons people feel tired, not just sleep
- There can be many reasons for relationship problems

4.2.2 Sleep Beliefs Scale (SBS)

The effects of age

The SBS measured sleep hygiene which can be defined as behavioural practices that promote good sleep quality, adequate sleep duration and full daytime alertness (Hauri, 1991; LeBourgeois et al., 2005). In regards to sleep hygiene knowledge, the current study found that the two age groups were significantly different. As expected, the younger adults had more incorrect beliefs/less sleep hygiene knowledge than the older adults. This finding is consistent with previous research that found young adults (university students) had poor sleep which was associated with their poor sleep hygiene

knowledge (Brown et al., 2002; LeBourgeois et al., 2005). Research has highlighted that the lifestyle of younger adults may hinder their sleep and ability to practice good sleep hygiene behaviours (Suen et al., 2010).

When individual SBS questions were examined as a function of age the analysis revealed that the two age groups were significantly different on 14 items of the SBS. The younger adults had significantly less sleep hygiene knowledge than the older adults on questions: *(5) Going to bed and waking up always at the same hour; (6) Thinking about one's engagements for the next day before falling asleep; (8) Smoking before falling asleep; (9) Diverting one's attention and relaxing before bedtime; (10) Going to bed 2 hours later than the habitual hour; (12) Using the bed for eating, calling on the phone, studying and other non-sleeping activities; (13) Trying to fall asleep without feeling tired; (14) Studying or working intensely until late at night; (16) Going to bed 2 hours earlier than the habitual hour; (17) Going to bed immediately after eating; (18) Being worried about the impossibility of getting enough sleep;* and *(19) Sleeping in a quiet and dark room.* However, mean scores indicate that the younger adults had adequate knowledge on these questions. This finding is consistent with research that found that young adults have adequate sleep hygiene knowledge but are less likely to practice it (Brown et al., 2002). However given that some research has found that sleep hygiene knowledge is associated with better sleep quality these findings would be worth more investigation (LeBourgeois et al., 2005). Specifically, further research would be of interest to examine the specific effects of lower scores on these items by younger adults comparative to older adults.

Whereas, the older adults had significantly less sleep hygiene knowledge than the younger adults on questions: *(1) Drinking alcohol in the evening,* and *(20) Recovering lost sleep by sleeping for a long time* (described in more detail below).

The overall differences between age groups may indicate that older adults are more concerned about the effects of poor sleep on daytime functioning compared to younger adults (consistent with the findings on the VOSS). Therefore, it is suggested that due to this increased concern regarding sleep the older adults are more likely to gain knowledge about sleep hygiene and be concerned about practicing the correct sleep

hygiene behaviours. These concerns of the older adults may arise from the fact that they experience more sleep disruptions than younger adults and therefore may be more likely to receive treatment for or learn about sleep hygiene and thus have more sleep hygiene knowledge. This finding has been discussed previously, that as people get older they get less deep sleep and have more uninterrupted sleep (Ohayon et al., 2004). In addition, it may suggest that younger adults are better able to cope with the daytime consequences of poor sleep than the older adults and may thus be less concerned generally about good sleep practices. Research has found that older adults commonly overestimate or show excessive concern regarding their day-time functioning due to lack of sleep (Morin et al., 1993). For example, they may believe they are unable to function well the next day or carry out activities well due to a poor night's sleep.

Both the younger and older adults shared similarities in the questions that they scored lowest on, indicating that both age groups have poor sleep hygiene knowledge on the following questions.

There was a significant difference between age groups on item *(1) Drinking alcohol in the evening*. Based on the mean the older adults had less sleep hygiene about the effects of drinking alcohol in the evening than the younger adults. The younger adults score also fell in the poor sleep hygiene range indicating they have poor sleep hygiene regarding the effects of drinking alcohol in the evening. The differences between older and younger adults may indicate views on a nightcap versus binge effect. Specifically, younger adults may be more likely to binge drink at night (especially on weekends, Oei & Morawska, 2004), whereas older adults may be more likely to have alcohol as a nightcap, with both groups incorrectly believing that alcohol's effect on sleep was more likely to be positive than negative. This item suggests that education regarding the effect of alcohol use before bed on sleep would benefit both age groups in the community. Further research would be of interest to replicate the differences between the age groups on alcohol use before bed and better understand the rationale of the respondents for their views.

There was not a significant difference between age groups on item (3) *Doing intense physical exercise before going to bed*. However, based on the mean both age groups held poor sleep hygiene knowledge on this question. However, the question of the

impact of intense physical exercise before going to bed on sleep is controversial in the sleep literature. In sleep hygiene it is suggested that intensive physical exercise should not be done within the last few hours before bed time, as research has previously found that it negatively impacts on sleep (Suen et al., 2010). However, conflicting evidence has found that late-night exercise does not disturb sleep quality (Myllyma et al., 2011) and in healthy young good sleepers exercise before bed has been shown to improve sleep (Flausino, Da Silza Prado, Queiroz, Tufik & Mello, 2012). Therefore it is debateable whether low scores on this question truly reflect poor sleep hygiene knowledge and may reflect why a significant difference between age groups was not found.

There was a significant difference between age groups of item *(20) Recovering lost sleep by sleeping for a long time*. Based on the mean the older adults had less sleep hygiene knowledge about the effects of recovering lost sleep by sleep for a long time than the younger adults. The younger adults score also fell in the poor sleep hygiene range indicating they also had poor sleep hygiene regarding the effects of recovering lost sleep by sleep for a long time. The differences between older and younger adults may indicate that older adults try to compensate for their age-related decrease in deeper sleep or more fragmented sleep by attempting to sleep for longer periods (Ohayon et al., 2004). Similarly, younger adults having poor sleep hygiene knowledge on this item may be due to research that suggests that particularly adolescents are sleep deprived and try to "catch up" on their sleep by sleeping in on the weekends (Cain et al., 2011).

The effects of gender

As expected, the younger male adults had more incorrect beliefs/less sleep hygiene knowledge than the older adults and females (respectively). This finding is consistent with previous research which found that young males have less sleep hygiene knowledge than young females (Adan et al., 2006). One explanation may be that research has found that women were more affected by a poor night of sleep than were men (Scott & Judge, 2006). This is also consistent with research that females are more likely to seek treatment/information for health and/or medical problems, which may indicate they are more likely to have greater knowledge about sleep hygiene practices. However, in the current research no gender differences were found between the older

adults. This indicates that gender differences are of greater importance in younger adults. Research supporting this found that when looking at driving and sleep, younger males were more likely to have motor vehicle accidents due to falling asleep (Pack, Rodgman, Cucchiara, Dinges & Schwab, 1995) than any other age. This finding suggests that young males are possibly poorer in judging their own level of sleepiness. Thus they may have a poorer feedback loop than females and this may mean they are less likely to learn from their behaviours about what is bad for their sleep. In addition to this, the effects of sleep deprivation secondary to lifestyle factors can particularly affect younger adults. This age group shows decreasing in total sleep time, later bedtimes, early morning arising, and an increased level of daytime sleepiness (Cain et al., 2011).

When individual SBS questions were examined across gender the analysis revealed that the males had significantly less sleep hygiene knowledge than the females on 3 items of the SBS. These items showing a significant gender difference were *(10) Going to bed 2 hours later than the habitual hour, (14) Studying or working intensely until late at night* and *(17) Going to bed immediately after eating*. These findings may indicate that males are less concerned about the negative impact of these behaviours on sleep when compared to females. However, the mean values of the scores for both genders reflect adequate sleep hygiene knowledge on these items. Further research into gender differences on such items would help to provide more clarity.

Summary and conclusions

Limited published research to date has compared sleep hygiene knowledge from a developmental perspective. Therefore these results provide interesting findings that younger adults, and especially younger males, have less sleep hygiene knowledge than older adults. Much research has shown that sleep quality and sleep hygiene knowledge are associated therefore this would be of benefit to educate people in the general community about sleep hygiene behaviours and their impact on sleep, thus possibly increasing sleep quality. In summary the following would be of benefit for both age groups and genders in the general community to focus on in education:

- The negative impacts of drinking alcohol in the evening

- Recovering lost sleep by sleeping for a long time.

4.2.3 Sleep Plot

When examining exploratory hypothesis using a relatively new tool (Lack, 2007) to measure people's perceptions about a typical night sleep for both an 18 and 65 year old, many consistent differences were found in what people perceive the sleep of each age group obtains. In the current study the first six hypotheses related to the Sleep Plot and whether the Sleep Plots of the healthy 18 and 65 year old Sleep Plot were significant different. Furthermore these hypotheses addressed whether the older and younger respondents plotted these Plots significantly different. The various analyses of the Sleep Plots (hypothesis 1-6) consistently showed that the healthy 65 year old Plot had lighter sleep than the healthy 18 year old Plot, regardless of the age of the respondent. In addition to this, gender was not significant in any of the above hypotheses, for both age groups, indicating that both males and females have similar perceptions of sleep across the night. It may be that gender differences were not found as gender was not incorporated into the instructions for the Sleep Plot. It would be interesting for further research to ask participants to plot the sleep for a male and female's sleep. The findings of lighter sleep for the 65 yr old compared to the 18 yr old is quite a realistic portrayal of sleep, as slow wave sleep decreases with age. Sleep literature has shown that the sleep of healthy older people is characterised by an increase in Stage 1 sleep and a decrease in Stages 3 and 4 (deep sleep), resulting in more frequent and prolonged awakenings (Ohayon et al., 2004). Consistent with this lighter sleep with increased age, older adults are more likely to wake to sounds at lower volumes than younger adults (Zepelin, McDonald & Zammit, 1984). Sleep literature has consistently found that four age related changes in sleep occur being, total sleep time, sleep efficiency, and slow-wave sleep all decrease, while wake after sleep onset increases with age (Ohayon et al., 2004).

As expected, the qualitative analysis revealed that both age groups provided a Sleep Plot of uninterrupted and deep sleep across the night for both the 18 and 65 year old Sleep Plots (hypothesis 7). Very few participants plotted awakenings during the night. This is important given that a typical night's sleep is that of alternating stages of sleep,

and awakenings are normal during the night, in particular for older adults. These findings are similar to that found by Lack (2007) whereby participants plotted the sleep for a healthy young adult and a large majority (70%) of the public believed that the sleep for a healthy young adult is an unbroken deep sleep. Similarly, Lack (2007) found that participants plotted unrealistically deep sleep with few awakenings (like a bell shape curve from going to sleep to awakening in the morning).

Due to limited research using the Sleep Plot (Lack, 2007) whereby participants plot the sleep, from going to sleep to awakening in the morning, for both a healthy 18 and 65 year old, the results provide new and interesting findings. In summary, both age groups believe that the Sleep Plot of a healthy 65 year old has less deep sleep than the healthy 18 year old Sleep Plot. Also, both age groups plotted unrealistic sleep on both the 18 and 65 year old Sleep Plots, being that of deep and uninterrupted sleep with few awakenings. Therefore if both age groups and genders have limited knowledge on the normal stages of sleep, including phases of deeper and lighter sleep, and awakenings during the night this may increase dysfunctional beliefs about sleep when these expectations are not met. Particularly, unrealistic sleep expectations may increase one's vulnerability to developing distress about sleep patterns and this heightened anxiety may lead to insomnia. Dysfunctional beliefs and attitudes about sleep are known to impact on sleep and the findings of the current study highlights the need to target sleep education on what is 'normal' sleep and sleep expectations. Specifically, educating people in the general community on awakenings during the night, being they are common and a normal occurrence during the night. As well as education related to a normal night of sleep consisting of cycles of lighter and deeper sleep would benefit the general community.

4.3 Limitations and directions for future research:

This study has numerous strengths, including developing a new sleep scale (VOSS), relatively good response rates and findings in a new area of research (developmental community beliefs about sleep). The present study relied on self-administration questionnaires for volunteer participants to respond about the sleep of people in general, not their own sleep. Questionnaire-based studies may have relatively low response rates, which may create bias. It can be argued that in a sleep survey (e.g., the present study),

people who have a sleep problem are more likely to respond to a questionnaire about sleep. The current study had relatively adequate response rates (Phase One 41.3% and Phase Two 42.2%). The current study did not measure participants' own personal sleep to screen for participants that either had a sleep disorder or were poor sleepers. Rather the study made the assumption that the majority of participants would not have insomnia or severely poor sleep. The assumption that the sample represents a wide sample of sleep quality was made. Considering sleep problems are among the most frequent health complaints, the number of people with sleeping problems may have been over-represented in the current sample, leading to more respondents giving answers suggesting dysfunctional views on sleep. This may have influenced the mean scores yielded for both individual items and sum scores on the VOSS and SBS, but is unlikely to have affected group differences. However, such an influence is expected to have been minimised by the fact that the participants were asked to consider the sleep of people in general, not their own sleep. In regards to the younger participants, they were not controlled on whether they had recently studied psychology either at university or secondary school. Previous study of sleep psychology may have resulted in them being more aware of sleep issues than the general population. However, the current study made attempts to get a wide range of participants reflective of the general population, without a strong bias to university students.

The use of the SBS in the study has some limitations. For the purpose of the current study the SBS was used to assess people's sleep hygiene knowledge. However, some items of the SBS can more be described as measuring stimulus control. Item 5 'Going to bed and waking up always at the same hour' is a compound item and ideally should be separated into two items. It is also debatable as to whether going to bed and waking up at the same hour is recommended for good sleep. Both items 10 'Going to bed 2 hours later than the habitual hour' and item 16 'Going to bed 2 hours earlier than the habitual hour' are more measures of stimulus control. It can also be argued that going to bed earlier or later than the habitual hour are positive behaviours dependant on whether one is sleepy at the time and also shows that the person is not overly preoccupied with sleep. In addition to this, item 18 'Being worried about the impossibility of getting enough sleep' may be more reflective of measuring ones beliefs about sleep. The authors developed this scale to assess people's sleep behaviour beliefs. For the purpose of the

current study it needs to be acknowledged that the SBS reflects beliefs about sleep that are not confined to just sleep hygiene.

Another possible limitation of the current study is that, the measures/questionnaires used had not been validated for specific use in the general population. However, as set out in the results, factor analyses and reliability analysis were carried out. Further limitations of the current study in regards to the questionnaires were the results of the confirmatory factor analyses. Potential limitations of using a confirmatory factor analysis may have affected these results (as discussed above in section 4.1.1). Further research on the psychometric properties and scale development of the VOSS would be of interest. The current study aimed to rectify the shortcomings in the results yielded by the confirmatory factor analyses by examining the psychometric properties of the summated items that make up the VOSS and SBS scales (which both had good internal consistency) as well as each individual item (which also had good internal consistency).

It should be noted that although significant group differences were found using the VOSS and SBS some of the effect sizes of these differences were low. This may indicate that despite there being a significant difference between the two groups on these questionnaires, the strength of this difference is low. Research proposes that a small effect size is 0.10, medium is 0.30 and a large effect size is 0.50 (Tabachnick & Fidell, 2007). The current study found that the significant difference between age groups on the VOSS score was low (0.21). This suggests that conclusions drawn from the VOSS should be interpreted with caution, as large differences were not found. In contrast the significant difference between age groups on the SBS sum score was large (1.00) and the significant difference on the SBS sum score across gender was also large (0.54). Thus the results and conclusions drawn from the SBS appear to be a particularly robust when noting the differences between groups on sleep hygiene knowledge.

Overall, this study provided new knowledge about dysfunctional beliefs and attitudes about sleep, sleep hygiene knowledge and perceptions of sleep as a function of age. The assessed attitudes and knowledge reflected general community, not personal, perceptions of sleep. Given the lack of published research in the area further research and replication of current findings are needed. This would aid in building a more comprehensive understanding of the incorrect sleep beliefs and attitudes in the general

community. Such an understanding may aid in the prevention of sleeping problems occurring through the development of age targeted sleep education programs addressing factors known to impact on sleep (dysfunctional beliefs and attitudes, sleep perceptions, and sleep hygiene). In addition to this, such information may aid health professionals in the treatment of sleep problems, by focusing and addressing problematic cognitions more specifically.

Further extended areas of research that may be of benefit/interest include the investigation of more community perceptions about sleep and their possibly association/link to developing sleep problems:

- It would be of interest to investigate a more comprehensive account of dysfunctional beliefs and attitudes about sleep, sleep hygiene and sleep perceptions on adolescents (as they current study only investigated this from 18 years of age).

- Further testing of the psychometric properties of the VOSS and SBS on a general population sample to clarify any possible factor structure.

- To further investigate older adults sleep hygiene knowledge to measure whether possible high scores may reflect over-concern regarding sleep (consistent with their responses about sleep beliefs).

- Measuring and controlling for factors such as current sleeping problems/diagnosed sleeping problems to get a more thorough understanding of community beliefs about sleep as a function of age.

- To longitudinally investigate the development of dysfunctional beliefs and attitudes about sleep in the general community and their association with developing more severe sleeping problems.

- The use of education and prevention measures to address community dysfunctional beliefs about sleep. Furthermore, it would be of interest to measure pre and post education on sleep to people in the general community and any possible relationship with sleep quality.

4.4 Conclusions

This is the first study to show that dysfunctional beliefs and attitudes about sleep are present in both younger and older adults in the general community. This study adds to research that suggests that dysfunctional beliefs and attitudes about sleep are not restricted to those with poor sleep but are more widespread across the community. This suggests that education related to the impact of dysfunctional beliefs and attitudes about sleep on sleep would benefit the entire community, not just those with a sleeping problem. Education targeted to the community may start to change widespread faulty beliefs about sleep and therefore may be helpful in the prevention and/or treatment of insomnia. Given that research has found dysfunctional beliefs about sleep are important in perpetuating sleep problems education targeting these beliefs in the general public may increase awareness in normal variations in sleep before they become a bigger problem. Importantly, this study has revealed that older adults in the general community are over catastrophising the effects of poor sleep on day time functioning and hold many dysfunctional beliefs and attitudes about sleep. These findings suggest that as older adults get less deep sleep they may be more likely to be concerned about the effects of poor sleep on their functioning. Additionally, younger people are, in general, better able to cope with the effects of sleep deprivation than older people.

This study has found that for educational and/or treatment purposes the following dysfunctional beliefs and attitudes about sleep would benefit targeting older adults in the general community.

- People need 8 hours of sleep to feel refreshed and function well during the day.
- When people feel tired, have no energy, or just seem not to function well during the. day, it is generally because they did not sleep well the night before.
- Poor sleep can lead to greatly disturbed family/personal relationships.
- Chronic insomnia may have serious consequences on physical health.
- A poor night's sleep will interfere with activities the next day.
- Without an adequate night's sleep it is hard to function the next day.

It should be noted that sleep apnoea may be experienced as insomnia so some caution should be taken, especially with the above point about chronic insomnia. Thus parallel education about seeking medical advice about possible respiratory problems in sleep should be undertaken.

Furthermore, the study has revealed that younger adults also hold many dysfunctional beliefs and attitudes about sleep. This study found that younger adults are also over catastrophising the effects of poor sleep on day time functioning. This study has found that for educational and/or treatment purposes the following dysfunctional beliefs and attitudes about sleep would benefit targeting younger adults in the general community.

- Chronic insomnia may have serious consequences on physical health.
- A poor night's sleep will interfere with activities the next day.
- Without an adequate night's sleep it is hard to function the next day.

The current study also found that younger adults have less sleep hygiene knowledge than older adults. Additionally, it was found that younger males had less sleep hygiene knowledge than the younger females and older adults, respectively. Explanations for these findings may suggest that older adults are more concerned about sleep and therefore practicing the correct sleep hygiene behaviours is important to them. It was found that the following sleep hygiene practices, highlighted below, had the least sleep hygiene knowledge, across both ages and genders. Therefore, education targeting the following sleep hygiene practices for both younger and older adults (more so older adults) is important:

- Drinking alcohol in the evening
- Recovering lost sleep by sleeping for a long time.

Importantly this study has revealed that both younger and older adults in the general community have some unrealistic perceptions of what constitutes a typical night's sleep.

While the fact that sleep gets lighter with increasing age was portrayed in Sleep Plots by all participants, both age groups incorrectly perceived that a typical night's sleep for a healthy adult was one of uninterrupted sleep. The implications of this finding are that people may become anxious when these sleep expectations are not met. As research has shown that cognitive arousal and anxiety can feed into sleeping problems and potentially make them worse, this is an important area to address. Specifically, educating people in the general community that awakenings during the night are common and normal during the night. As well as education related to a normal night of sleep consisting of cycles of lighter and deeper sleep would benefit the general community.

Overall, this research adds to the body of research suggesting that the general community would benefit from sleep education that targets dysfunctional beliefs and attitudes about sleep, creates realistic sleep expectations, and increases sleep hygiene knowledge. Such education is likely to decrease the development of significant sleep problems. Clinicians have long understood that an important part of the therapy for insomnia is addressing dysfunctional cognitions about sleep. Most previous research has demonstrated that dysfunctional beliefs and attitudes about sleep are important in those who are defined as poor sleepers when compared to good sleepers (Morin et al., 1993). The results of the current study show that faulty beliefs about sleep are not confined to those presenting with insomnia at clinics. Both age groups, from the general community, had many faulty sleep hygiene beliefs (with younger adults having more) as well as believing sleep is deep and uninterrupted across the night. This study shows that such dysfunctional cognitions are widespread in the community and some aspects vary across age groups. It highlights the need to better educate people from the general community about sleep expectations, sleep beliefs, good sleep hygiene behaviours as well as the usual sleep-wake cycles across the night. Such challenges to dysfunctional beliefs and attitudes about sleep, will help reduce anxiety about sleep disturbances and decrease the likelihood of people developing more severe sleep difficulties.

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Appendix A: Information for Participants Involved in Research Phase One

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

You are invited to participate

We are inviting individuals aged 18 years and older to participate in a research project entitled: **Developmental Perspectives on Community Beliefs and Attitudes about Sleep**.

This project is being conducted by a student researcher, Chelsea Dolan, as part of a Doctorates of Clinical Psychology course at Victoria University under the supervision of Professor Dorothy Bruck from the Faculty of Arts, Education and Human Development.

Project explanation

Previous research suggests that a variety of faulty beliefs, expectations, and attributions about sleep are influential in causing or continuing poor sleep. The purpose of the study is to examine people's beliefs and attitudes about sleep.

What will I be asked to do?

In this research you will be required to complete two anonymous questionnaires about sleep. All tasks in total will take approximately 15 minutes of your time. The questionnaires will ask you to rate your agreement/disagreement with a list of sleep related statements and the other questionnaire will ask you to tick the response you think best describes the effect a behaviour may have on sleep. **Note that these questions relate to your views about sleep and are not about your own sleep.** Participation in this research is completely voluntary and if you decide to participate you may complete the tasks when given to you or place them in the replied paid envelope and post them to the researcher.

What will I gain from participating?

While we do not anticipate that you, as an individual, will receive any benefits from your participation in this project, this research will help those working in the health professions understand more about people's beliefs about what constitutes 'good' sleep and how these change with age.

How will the information I give be used?

All questionnaires will remain confidential. **As a participant you are NOT required to disclose your name**. The information that participants provide will be used in this study and possibly future studies, which may be published. Participant's data will be stored in line with ethical guidelines set out by Victoria University.

By completing the questionnaires, it is implied that you have given consent for your data to be used and reported as a group.

What are the potential risks of participating in this project?

This research poses minimal risks, however if at any time while participating in this study you feel discomfort or anxiety please feel free to cease completing the questionnaires and withdraw your participation. Withdrawal from the study will have no negative consequences, as you only consent to participate upon returning the questionnaires to the researcher. If you feel any significant anxiety about your own sleep and/or well being we encourage you to contact your local doctor or psychologist, Dr. Gerard Kennedy by phone on 99192481 or email Gerard.Kennedy@vu.edu.au

How will this project be conducted?

The data will be collected, and using a statistical package, will be analysed and compared to other participants within the study.

Who is conducting the study?

This study is being conducted through Victoria University. If you have any queries regarding your participation in this study please feel free to contact the Principal Research or Student Researcher on the contact details provided below:

Principal Researcher:
Professor Dorothy Bruck
Email: Dorothy.bruck@vu.edu.au
Phone: 9365 2158

Student Researcher:
Chelsea Dolan
Email: Chelsea.dolan@live.vu.edu.au
Phone: 0422 293 917

Any queries about your participation in this project may be directed to the Principal Researcher listed above.
If you have any queries or complaints about the way you have been treated, you may contact the Secretary, Victoria University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, VIC, 8001 phone (03) 9919 4781.

Appendix B: Views on Sleep Scale (VOSS) - Phase One

Views On Sleep Scale (VOSS)

A number of statements reflecting people's beliefs and attitudes about sleep are provided below. Please indicate to what extent you agree or disagree with each statement by circling the appropriate response from the five alternatives. Even if you do not have a sleep problem, please answer all questions.

Please Provide your: **AGE:_____** **GENDER:_____**

1. People need 8 hours of sleep to feel refreshed and function well during the day.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

2. Medication is probably the only solution to sleeplessness.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

3. Everyone should be able to fall asleep as soon as their head hits the pillow.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

4. Sleeping pills prescribed these days are a safe and effective cure for chronic insomnia.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

5. Most people wake up a few times during the night.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

6. Poor sleep leads to nausea and headaches.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

7. When people feel tired, have no energy, or just seem not to function well during the day, it is generally because they did not sleep well the night before.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

8. Poor sleep can lead to greatly disturbed family/personal relationships.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

9. Chronic insomnia may have serious consequences on physical health.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

10. Waking up during the night suggests a sleeping problem.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

11. Insomnia is essentially the result of a chemical imbalance, which sleeping tablets can fix.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

12. A poor night's sleep will interfere with activities the next day.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

13. Poor sleep leads to people becoming socially withdrawn.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

14. Insomnia does not respond to therapies that aim to change behaviours.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

15. When people feel irritable, depressed, or anxious during the day, it is mostly because they did not sleep well the night before.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

16. A good night's sleep means sleeping like a log all night.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

17. Herbal remedies can be a big help for insomnia.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

18. If a person goes without sleep for 1 or 2 nights, they may have a "nervous breakdown".

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

19. Sleeping tablets are only effective for short-term sleeping problems.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

20. Healthy sleep means falling asleep quickly.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

21. Not getting enough sleep leads to a shorter life expectancy.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

22. Faulty practices around sleep-wake behaviours can cause ongoing sleep problems.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

23. Sleep problems are a major cause of life problems.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

24. Many false claims are made about relief for sleep problems with herbal remedies.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

25. Without an adequate night's sleep it is hard to function the next day.

Strongly agree Agree neither agree nor disagree Disagree Strongly disagree

Appendix C: Sleep Beliefs Scale (SBS)

The Sleep Belief's Scale (SBS)

This is a survey of the effects of selected behaviours upon sleep. We are interested in knowing your opinion about whether any of these behaviours may influence the quality and/or quantity of sleep. For the following list of behaviours, please indicate whether you believe they produce a 'positive' effect, a 'negative' effect, or 'neither' effect on sleep. Please do not make reference to how they influence your sleep in particular, but to **the effects you think these behaviours have on people in general**. Please answer ALL the statements by ticking the appropriate box, even if you are not completely sure of the answer.

	Positive effect	Neither effect	Negative effect
1. Drinking alcohol in the evening	☐	☐	☐
2. Drinking coffee or other substances with caffeine after dinner	☐	☐	☐
3. Doing intense physical exercise before going to bed	☐	☐	☐
4. Taking a long nap during the day	☐	☐	☐
5. Going to bed and waking up always at the same hour	☐	☐	☐
6. Thinking about one's engagements for the next day before falling asleep	☐	☐	☐
7. Using sleep medication regularly	☐	☐	☐
8. Smoking before falling asleep	☐	☐	☐
9. Diverting one's attention and relaxing before bedtime	☐	☐	☐
10. Going to bed 2 hours later than the habitual hour	☐	☐	☐
11. Going to bed with an empty stomach	☐	☐	☐
12. Using the bed for eating, calling on the phone, studying and other non-sleeping activities	☐	☐	☐
13. Trying to fall asleep without feeling tired	☐	☐	☐
14. Studying or working intensely until late at night	☐	☐	☐
15. Getting up when it is difficult to fall asleep	☐	☐	☐
16. Going to bed 2 hours earlier than the habitual hour	☐	☐	☐
17. Going to bed immediately after eating	☐	☐	☐
18. Being worried about the impossibility of getting enough sleep	☐	☐	☐
19. Sleeping in a quiet and dark room	☐	☐	☐
20. Recovering lost sleep by sleeping for a long time	☐	☐	☐

Appendix D: Ethics Approval Letter

VICTORIA UNIVERSITY | A NEW SCHOOL OF THOUGHT

MEMO

TO	Professor Dorothy Bruck School of Social Sciences and Psychology St Albans Campus	DATE	27/04/2009
FROM	Dr Harriet Speed Chair Victoria University Human Research Ethics Committee		
SUBJECT	Amendment to Ethics Application – HRETH 08/150		

Dear Prof Bruck

Thank you for submitting this application for ethical approval of the project:

HRETH 08/150 Developmental Perspectives on Community Beliefs and Attitudes about Sleep

The amendment to the proposed research project has been accepted and deemed to meet the requirements of the National Health and Medical Research Council (NHMRC) 'National Statement on Ethical Conduct in Human Research (2007)' by the Victoria University Human Research Ethics Committee. Approval has been granted from 27 April 2009 to 31 March 2010.

Continued approval of this research project by the Victoria University Human Research Ethics Committee (VUHREC) is conditional upon the provision of a report within 12 months of the above approval date (by ***27 April 2010***) or upon the completion of the project (if earlier). A report proforma may be downloaded from the VUHREC web site at: http://research.vu.edu.au/hrec.php

Please note that the Human Research Ethics Committee must be informed of the following: any changes to the approved research protocol, project timelines, any serious events or adverse and/or unforeseen events that may affect continued ethical acceptability of the project. In these unlikely events, researchers must immediately cease all data collection until the Committee has approved the changes. Researchers are also reminded of the need to notify the approving HREC of changes to personnel in research projects via a request for a minor amendment.

If you have any queries, please do not hesitate to contact me on 9919 5412.

On behalf of the Committee, I wish you all the best for the conduct of the project.

Dr Harriet Speed
Chair
Victoria University Human Research Ethics Committee

Appendix E: Views on Sleep Scale (VOSS) – Phase Two

Views on Sleep Scale (VOSS)

A number of statements reflecting people's beliefs and attitudes about sleep are provided below. Please indicate to what extent you agree or disagree with each statement by circling the appropriate response from the five alternatives. Even if you do not have a sleep problem, please answer all questions.

Please Provide your: **AGE:_____** **GENDER:_____**

1. People need 8 hours of sleep to feel refreshed and function well during the day.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

2. Medication is probably the only solution to sleeplessness.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

3. Everyone should be able to fall asleep as soon as their head hits the pillow.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

4. Sleeping pills prescribed these days are a safe and effective cure for chronic insomnia.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

5. When people feel tired, have no energy, or just seem not to function well during the day, it is generally because they did not sleep well the night before.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

6. Poor sleep can lead to greatly disturbed family/personal relationships.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

7. Chronic insomnia may have serious consequences on physical health.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

8. Waking up during the night suggests a sleeping problem.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

9. Insomnia is essentially the result of a chemical imbalance, which sleeping tablets can fix.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

10. A poor night's sleep will interfere with activities the next day.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

11. Poor sleep leads to people becoming socially withdrawn.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

12. Insomnia does not respond to therapies that aim to change behaviours.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

13. When people feel irritable, depressed, or anxious during the day, it is mostly because they did not sleep well the night before.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

14. A good night's sleep means sleeping like a log all night.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

15. If a person goes without sleep for 1 or 2 nights, they may have a "nervous breakdown".

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

16. Healthy sleep means falling asleep quickly.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

17. Not getting enough sleep leads to a shorter life expectancy.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

18. Faulty practices around sleep-wake behaviours can cause ongoing sleep problems.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

19. Sleep problems are a major cause of life problems.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

20. Without an adequate night's sleep it is hard to function the next day.

Strongly agree *Agree* *neither agree nor disagree* *Disagree* *Strongly disagree*

Appendix F: Sleep Plot

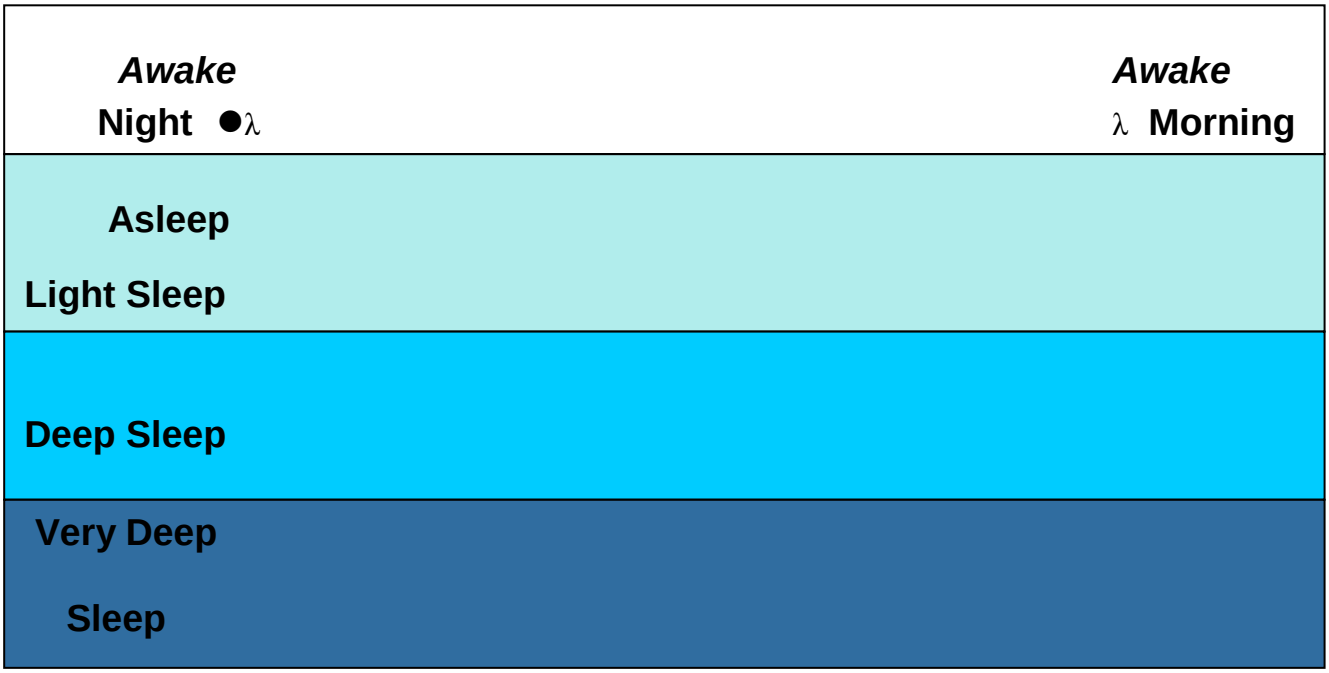
SLEEP PLOT SCALE

This task has two parts:

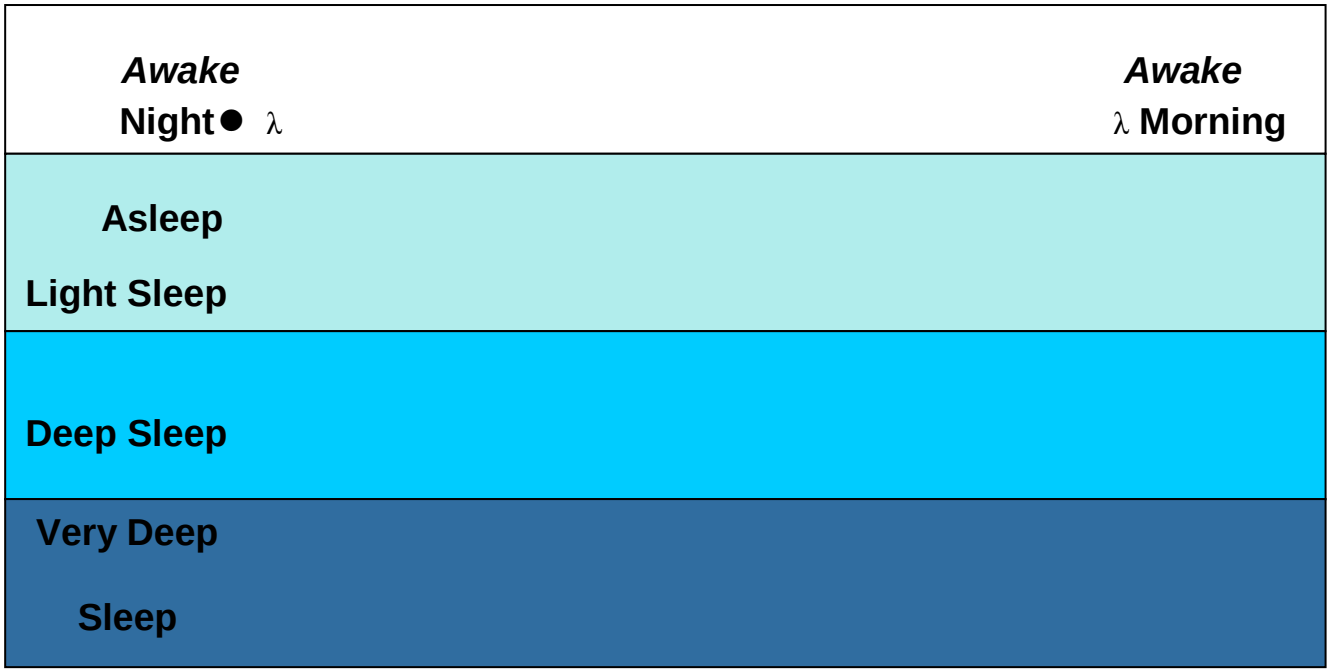
On **this page** your sleep plot will show us your understanding of the nature of a **normal night of sleep for a healthy 18 year old.**

On the **next page** your sleep plot will relate to the **normal night of sleep for a healthy 65 year old.**

Please do this by drawing a continuous line in the box below across the normal night time period. Start the line at the λ mark in the upper left corner, representing the start of the night's sleep, and stop the line at the λ mark in the upper right hand corner of the box, representing awakening in the morning. The dashed horizontal line between awake and above and sleep below marks the transition point between awake and asleep. The darker bands indicate deeper sleep. With this continuous line indicate your understanding of the progress through the night of a **normal sleep of a healthy 18 year old.**



Now create a sleep plot, using the same starting and ending points (λ) as before, for the **normal sleep of a healthy 65 year old.**



Appendix G: Information for Participants Involved in Research Phase Two

INFORMATION TO PARTICIPANTS INVOLVED IN RESEARCH

You are invited to participate

We are inviting individuals aged either 18 - 25 years or 60 years and older to participate in a research project entitled: **Developmental Perspectives on Community Beliefs and Attitudes about Sleep**.

This project is being conducted by a student researcher, Chelsea Dolan, as part of a Doctorates of Clinical Psychology course at Victoria University under the supervision of Professor Dorothy Bruck from the Faculty of Arts, Education and Human Development.

Project explanation

Previous research suggests that a variety of beliefs, expectations, and attributions about sleep may be influential in causing or continuing poor sleep. The purpose of the study is to compare the perceptions of two age groups (18 to 25 year olds and 60 years and older) in their beliefs and attitudes about sleep.

What will I be asked to do?

In this research you will be required to complete two anonymous questionnaires about sleep and a sleep plot task. All tasks in total will take approximately 20 minutes of your time. The questionnaires will ask you to rate your agreement/disagreement with a list of sleep related statements and the other questionnaire will ask you to tick the response you think best describes the effect a behaviour may have on sleep. **Note that these questions relate to your views about sleep and are not about your own sleep.** The sleep plot will ask you to draw two graphs of normal sleep patterns, one for a healthy 18 year old and the other for a healthy 65 year old. Participation in this research is completely voluntary and if you decide to participate you may complete the tasks when given to you or place them in the replied paid envelope and post them to the researcher.

What will I gain from participating?

While we do not anticipate that you, as an individual, will receive any benefits from your participation in this project, this research will help those working in the health professions understand more about people's beliefs about what constitutes 'good' sleep and how these change with age.

How will the information I give be used?

All questionnaires will remain confidential. **As a participant you are NOT required to disclose your name**. The information that participants provide will be used in this study (which may be published) and

presented as group data. Participants' data will be stored in line with ethical guidelines set out by Victoria University.

By completing the questionnaires, it is implied that you have given consent for your data to be used and reported as a group.

What are the potential risks of participating in this project?

This research poses minimal risks, however if at any time while participating in this study you feel discomfort or anxiety please feel free to cease completing the questionnaires and withdraw your participation. Withdrawal from the study will have no negative consequences, as you only consent to participate upon returning the questionnaires to the researcher. If you feel any significant anxiety about your own sleep and/or wellbeing we encourage you to contact your local doctor or psychologist, Dr. Gerard Kennedy by phone on 99192481 or email Gerard.Kennedy@vu.edu.au.

How will this project be conducted?

The data will be collected, and using a statistical package, will be analysed and compared to participants across the two age groups within the study.

Who is conducting the study?

This study is being conducted through Victoria University. If you have any queries regarding your participation in this study please feel free to contact the Principal Research or Student Researcher on the contact details provided below:

Principal Researcher:
Professor Dorothy Bruck
Email: Dorothy.bruck@vu.edu.au
Phone: 9365 2158

Student Researcher:
Chelsea Dolan
Email: Chelsea.dolan@live.vu.edu.au
Phone: 0422 293 917

Any queries about your participation in this project may be directed to the Principal Researcher listed above.
If you have any queries or complaints about the way you have been treated, you may contact the Secretary, Victoria University Human Research Ethics Committee, Victoria University, PO Box 14428, Melbourne, VIC, 8001 phone (03) 9919 4781.

Appendix H: Phase One: Exploratory factor analysis: factor loadings of the deleted items and statistics for all seven factors.

Factors and items	F 1	F 2	F 3	F 4	F 5	F 6	F 7
Amplification of the consequences of sleep							
(1) People need 8 hrs of sleep to feel refreshed & function well during the day	0.486						
(5) When people feel tired, no energy or not function well it is because they did not sleep well	0.652						
(6) Poor sleep can lead to greatly disturbed family/personal relationships	0.457						
(10) A poor night's sleep will interfere with activities the next day	0.703						
(11) Poor sleep leads to people becoming socially withdrawn	0.566						
(13) When people feel irritable, depressed, or anxious it is because they did not sleep well	0.462						
(19) Sleep problems are a major cause of life problems	0.555						
(20) Without an adequate night's sleep it is hard to function the next day.	0.767						
Poor sleep expectations							
(3) Everyone should be able to fall asleep as soon as their head hits the pillow		0.684					
(8) Waking up during the night suggests a sleeping problem		0.550					
(17) Not getting enough sleep leads to a shorter life expectancy		0.506					
Sleep medication							
(2) Medication is probably the only solution to sleeplessness;			0.666				
(4) Sleeping pills prescribed is a safe and effective cure for chronic insomnia			0.746				
(9) Insomnia is essentially the result of a chemical imbalance, which sleeping tablets can fix			0.723				
Treatment of and misattributions of the consequences of sleep							
(7) Chronic insomnia may have serious consequences on physical health				0.677			
(12) Insomnia does not respond to therapies that aim to change behaviours				0.533			
(15) If a person goes without sleep for 1-2 nights, they may have a "nervous breakdown"				0.363			
(18) Faulty practices around sleep-wake behaviours can cause ongoing sleep problems				0.721			
Good sleep expectations							
(14) A good night's sleep means sleeping like a log all night					0.739		
(16) Healthy sleep means falling asleep quickly					0.524		
Deleted items							
(6) Poor sleep leads to nausea and headaches	0.606						
(5) Most people wake up a few times during the night			0.602				0.503
(17) Herbal remedies can be a big help for insomnia						0.786	
(19) Sleeping tablets are only effective for short-term sleeping problems							0.607
(24) Many false claims are made about relief for sleep problems with herbal remedies						0.651	

Appendix I: Phase Two: Confirmatory factor analysis of the VOSS

Revised Variable loadings on Factors (F) of the VOSS.

Factors and items	F 1	F 2	F 3	F 4	F 5
Sleep expectations					
(3) Everyone should be able to fall asleep as soon as their head hits the pillow	0.734				
(8) Waking up during the night suggests a sleeping problem	0.639				
(14) A good night's sleep means sleeping like a log all night	0.714				
(15) If a person goes without sleep for 1-2 nights, they may have a "nervous breakdown"	0.574				
(16) Healthy sleep means falling asleep quickly	0.817				
(17) Not getting enough sleep leads to a shorter life expectancy.	0.518				
Consequences of sleep on day time functioning					
(1) People need 8 hrs of sleep to feel refreshed & function well during the day.		0.490			
(5) When people feel tired, no energy or not function well it is because they did not sleep well		0.771			
(10) A poor night's sleep will interfere with activities the next day		0.701			
(13) When people feel irritable, depressed, or anxious it is because they did not sleep well		0.641			
(20) Without an adequate night's sleep it is hard to function the next day		0.774			
Serious consequences of sleep					
(6) Poor sleep can lead to greatly disturbed family/personal relationships			0.744		
(7) Chronic insomnia may have serious consequences on physical health			0.821		
(11) Poor sleep leads to people becoming socially withdrawn			0.555		
(19) Sleep problems are a major cause of life problems.			0.605		
Sleep medication					
(2) Medication is probably the only solution to sleeplessness.				0.706	
(4) Sleeping pills prescribed are a safe and effective cure for chronic insomnia				0.837	
(9) Insomnia is essentially the result of a chemical imbalance, which sleeping tablets can fix				0.651	
Treatment attitudes about sleep					
(12) Insomnia does not respond to therapies that aim to change behaviours					0.824
(18) Faulty practices around sleep-wake behaviours can cause ongoing sleep problems					0.833

Phase Two: Confirmatory factor analysis of the VOSS

Revised Reliability coefficients of the factors of the VOSS.

Factors	Reliability (Cronbach's α)
Sleep expectations	0.878
Consequences of sleep on day time functioning	0.836
Serious consequences of sleep	0.821
Sleep medication	0.768
Treatment attitudes about sleep	0.688
Total scale	0.917

Appendix J: Sleep Plot descriptive statistics (hypotheses 1)

Mean and (standard deviations) for each time interval rating on the Sleep Plots depicting the sleep of an 18 yr old and 65 yr old adults (higher mean indicates deeper sleep). The first two columns of means are from Plots completed by both younger and older adults, while the last two columns are the means from Plots depicting the sleep of both the 18 and 65 yr olds, completed by each age group.

Variable	18 yr old Plot n = 108	65 yr old Plot n = 109	Younger adults n = 108	Older adults n = 109
Rating 1	0.71 (0.78)	0.66 (0.76)	0.55 (0.71)	0.86 (0.82)
Rating 2	1.68 (0.98)	1.50 (0.90)	1.56 (0.92)	1.80 (1.04)
Rating 3	2.05 (0.92)	2.00 (0.87)	2.05 (0.88)	2.05 (0.96)
Rating 4	2.28 (0.79)	2.22 (0.81)	2.23 (0.80)	2.33 (0.79)
Rating 5	2.44 (0.78)	2.35 (0.80)	2.35 (0.83)	2.53 (0.72)
Rating 6	2.56 (0.72)	2.39 (0.76)	2.50 (0.77)	2.62 (0.66)
Rating 7	2.58 (0.67)	2.37 (0.73)	2.56 (0.66)	2.60 (0.69)
Rating 8	2.55 (0.73)	2.24 (0.90)	2.57 (0.68)	2.53 (0.78)
Rating 9	2.54 (0.76)	2.22 (0.86)	2.56 (0.68)	2.52 (0.84)
Rating 10	2.52 (0.72)	2.13 (0.82)	2.56 (0.63)	2.49 (0.81)
Rating 11	2.46 (0.70)	2.02 (0.83)	2.42 (0.65)	2.50 (0.74)
Rating 12	2.22 (0.79)	1.78 (0.82)	2.19 (0.75)	2.25 (0.83)
Rating 13	1.94 (0.82)	1.60 (0.82)	1.86 (0.81)	2.03 (0.82)
Rating 14	1.62 (0.89)	1.27 (0.81)	1.58 (0.92)	1.66 (0.86)
Rating 15	0.79 (0.82)	0.62 (0.71)	0.76 (0.85)	0.83 (0.80)

Note: the Sleep Plots were scored on 3 points across 15 time intervals (0= awake, 1= light sleep, 2= deep sleep, 3= very deep sleep).

Sleep Plot descriptive statistics (hypotheses 4)

Mean and (standard deviations) for each time interval rating on the 65 year old Sleep Plots rated by the younger and older respondents (higher mean indicates deeper sleep).

Variable (65 year old Plot)	Younger Adults	Older Adults
Rating 1	0.53 (0.07)	0.79 (0.07)
Rating 2	1.46 (0.08)	1.54 (0.08)
Rating 3	2.11 (0.08)	1.90 (0.08)
Rating 4	2.30 (0.07)	2.16 (0.07)
Rating 5	2.37 (0.08)	2.31 (0.07)
Rating 6	2.37 (0.07)	2.39 (0.07)
Rating 7	2.36 (0.07)	2.38 (0.07)
Rating 8	2.32 (0.08)	2.15 (0.08)
Rating 9	2.29 (0.08)	2.13 (0.08)
Rating 10	2.12 (0.08)	2.10 (0.08)
Rating 11	2.00 (0.08)	2.03 (0.08)
Rating 12	1.76 (0.08)	1.81 (0.08)
Rating 13	1.63 (0.08)	1.58 (0.08)
Rating 14	1.23 (0.08)	1.30 (0.07)
Rating 15	0.62 (0.07)	0.63 (0.06)

Note: the plots were scored on 3 points across 15 time intervals (0= awake, 1= light sleep, 2= deep sleep, 3= very deep sleep).

Sleep Plot descriptive statistics (hypotheses 5)

Mean and (standard deviations) of the younger respondents on both age group plots (higher mean indicates deeper sleep).

Variable	18 year old Sleep Plots	65 year old Sleep Plots
Rating 1	0.55 (0.71)	0.53 (0.69)
Rating 2	1.56 (0.92)	1.46 (0.84)
Rating 3	2.05 (0.88)	2.10 (0.83)
Rating 4	2.23 (0.80)	2.29 (0.76)
Rating 5	2.35 (0.83)	2.37 (0.78)
Rating 6	2.50 (0.77)	2.38 (0.77)
Rating 7	2.56 (0.66)	2.36 (0.79)
Rating 8	2.57 (0.68)	2.32 (0.77)
Rating 9	2.56 (0.68)	2.31 (0.79)
Rating 10	2.56 (0.63)	2.16 (0.81)
Rating 11	2.42 (0.65)	2.02 (0.84)
Rating 12	2.19 (0.75)	1.77 (0.84)
Rating 13	1.86 (0.81)	1.62 (0.87)
Rating 14	1.58 (0.92)	1.22 (0.89)
Rating 15	0.76 (0.85)	0.59 (0.74)

Note: the plots were scored on 3 points across 15 time intervals (0= awake, 1= light sleep, 2= deep sleep, 3= very deep sleep).

Sleep Plot descriptive statistics (hypotheses 6)

Mean and (standard deviations) of the older respondents on both age group plots (higher mean indicates deeper sleep).

Variable	18 year old plots	65 year old plots
Rating 1	0.86 (0.82)	0.80 (0.81)
Rating 2	1.80 (1.04)	1.54 (0.96)
Rating 3	2.05 (0.96)	1.89 (0.90)
Rating 4	2.33 (0.79)	2.15 (0.85)
Rating 5	2.53 (0.72)	2.32 (0.83)
Rating 6	2.62 (0.66)	2.40 (0.75)
Rating 7	2.60 (0.69)	2.39 (0.79)
Rating 8	2.53 (0.78)	2.16 (1.01)
Rating 9	2.52 (0.84)	2.13 (0.92)
Rating 10	2.49 (0.81)	2.10 (0.84)
Rating 11	2.50 (0.74)	2.03 (0.83)
Rating 12	2.25 (0.83)	1.80 (0.88)
Rating 13	2.03 (0.82)	1.59 (0.78)
Rating 14	1.66 (0.86)	1.31 (0.72)
Rating 15	0.83 (0.80)	0.64 (0.68)

Note: the plots were scored on 3 points across 15 time intervals (0= awake, 1= light sleep, 2= deep sleep, 3= very deep sleep).

Appendix K: Sleep Plot example of a common response (18 year old Sleep Plot)

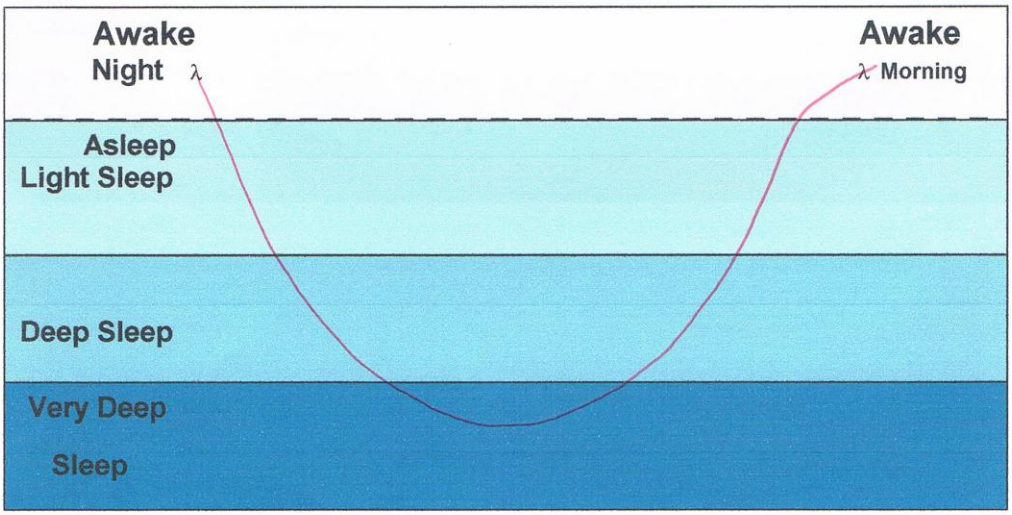
SLEEP PLOT SCALE

This task has two parts:

On **this page** your sleep plot will show us your understanding of the nature of a **normal night of sleep for a healthy 18 year old**.

On the **next page** your sleep plot will relate to the **normal night of sleep for a healthy 65 year old.**

Please do this by drawing a continuous line in the box below across the normal night time period. Start the line at the λ mark in the upper left corner, representing the start of the night's sleep, and stop the line at the λ mark in the upper right hand corner of the box, representing awakening in the morning. The dashed horizontal line between awake above and sleep below marks the transition point between awake and asleep. The darker bands indicate deeper sleep. With this continuous line indicate your understanding of the progress through the night of a **normal sleep of a healthy 18 year old**.



Sleep Plot example of a common response (65 year old Sleep Plot)

Now create a sleep plot, using the same starting and ending points (λ) as before, for the **normal sleep of a healthy 65 year old.**