Validation of the Greek version of the Adolescent Sleep Hygiene Scale (ASHS)

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Abstract

Transition from childhood to adolescence is known to bring about many changes in the lifestyle and psycho-emotional state of adolescents. One of the major lifestyle factors that affect adolescents’ physical and mental health is sleep. The aim of this study was to validate the Adolescent Sleep Hygiene Scale (ASHS), a tool that measures sleep hygiene, in an adolescent sample living in Greece. The study’s sample consisted of 146 Greek adolescents aged 12-18 years. The Adolescent Stress Questionnaire was used for convergent validity and correlation with adolescents’ stress. The pilot and the main study demonstrated sufficient internal consistency. Exploratory Factor Analysis showed an adequate adaptation of the original ASHS questionnaire to the Greek adolescents. The findings of this study support the use of ASHS as a reliable and valid tool for evaluating sleep-facilitating and sleep-inhibiting practices of Greek adolescents.

Introduction

Sleep is an important process for a person’s physical and mental health, development, learning, behaviour, emotional stability, and general functioning during the day. In terms of emotional balance, research on healthy people who sleep less than they need has shown that accumulation of sleep deprivation gradually leads to worsening of a person’s mood (Talbot et al., 2010). The study of Yoo et al. in people with insufficient sleep due to an emotional stimulus showed a 60% increase in amygdala activity compared to people who were relaxed (Yoo et al., 2007). This increased activity of the amygdala affects cognitive control and executive functions (Drummond et al., 1999; Muzur et al., 2002). The most common sleep disorders are those related to sleep apnea, insomnia, prolonged drowsiness, narcolepsy, restless legs syndrome / recurrent sleep syndrome extreme

fatigue during the day, increased arousal before bedtime and nightmares (the difference with bad dreams is that the nightmare causes a sudden cessation of sleep and waking up at night) (Nielsen et al., 2000).

The transition from childhood to adolescence is known to bring about many changes in the lifestyle and psycho-emotional state of adolescents. One of the major lifestyle factors that affects adolescence is sleep. Adolescents tend to be late to sleep and want to stay up late, even on weekdays (Kirov et al., 2017). This seems to be due to delays in their circadian rhythm, studying, activities, many hours at the computer, as well as increased social life (Wang et al., 2016). As a person gets older, sleep needs change, especially in the transition from infancy to adolescence, where there is a dramatic change during both the daytime and nighttime sleep needs. For example, an infant needs about 17 hours, a teenager 8 hours and a middle-aged man 6.5
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hours (Iglowstein et al., 2003) of sleep per day. During the transition from middle childhood to adolescence, a gradual delay in the start time of sleep, as well as changes in the starting time between weekdays and weekends and longer sleep duration on weekends are observed. These changes in sleep habits have become more pronounced in recent years, with an emphasis on the transition from childhood to adolescence (Bayer et al., 2007). More specifically, studies show that as the age increases from school to adolescence, the duration of sleep decreases (without it meaning that the needs decrease), usually due to delayed onset of sleep and forced waking up early in the morning (Owens et al., 2008). Sleep deprivation at this age is due in large part to a delay in the onset of adolescent sleep and waking up too early for school. In Greece, there is a large percentage of adolescents who complain of unsatisfactory sleep, more girls than boys (Lazaratou et al., 2008). According to the literature, most adolescents sleep later than they should due to reading, social life and use of electronic media, and get up early in the morning (Alfano et al., 2010). A survey in Britain found that 30% of 15-year-old boys and 49% of 15-year-old girls report sleep problems and 36% of all 15-year-olds report not getting enough sleep to cope with school obligations (Bruce et al., 2017). Lack of sleep leads to drowsiness during the day (Dewald et al., 2010) that causes problems in the adolescent’s cognitive skills, response to school and reading, and also in behaviour, risk-taking and emotional stability (anxiety, depression etc.) (Roberts et al., 2009). Poor sleep hygiene in the form of the use of digital media (TV, mobile, computer) predicts a delay in bedtime, reduced sleep duration, increased daytime sleepiness and even nightmares (Hale and Guan, 2015; Eggermont and Van den Bulck, 2006; Higuchi et al., 2005). The theory that the use of these media results in the development of sleep disorders is based on exposure to stimulating light, the content of the media (e.g. thrillers increase arousal), as well as the time consumed by the use of digital media (Foerster et al., 2019). As for adolescents with anxiety disorder, they may rely on digital media to avoid the onset of sleep or forget their worries. However, research shows that anxious teens spend more time watching television than healthy teens because they see it as a means of coping with stress (De Wit et al., 2011). The literature has reported a poor relationship between sleep hygiene and sleep problems (Mindell et al., 2009; LeBourgeois et al., 2005). However, there is a lack of extensive research regarding the relationship between sleep hygiene and its disorders in adolescents with anxiety disorders.

The association of sleep disorders with anxiety disorders in adolescents is a research topic of many studies in the recent years to understand if anxiety disorders cause sleep disorders and vice versa. The presence of an anxiety disorder causes a sleep problem, while the presence of a sleep disorder can subsequently cause an anxiety disorder (Sarchiapone et al., 2014). Even in young people, a large percentage that shows symptoms of an anxiety disorder also has problematic sleeping habits (Telzer et al., 2014). Children and adolescents with anxiety disorders tend to have a threat bias, and at the same time show an increased tendency to view dubious situations as threatening (Barrett et al., 1996; Blossom et al., 2013). In addition, adolescents with anxiety disorders have elevated cortisol levels at bedtime compared to groups of healthy adolescents (Forbes et al., 2006). Indeed, cortisol is associated with arousal, and high levels of arousal around bedtime result in delayed onset (Hatzinger et al., 2012).

The aim of this study was the cultural adaptation and validation of the Adolescent Sleep Hygiene Scale (ASHS), a tool that measures sleep hygiene, in an adolescent sample living in Greece.

Materials, Methodologies and Techniques

Participants

The study sample was recruited from the tertiary Center for Adolescent Medicine and UNESCO Chair on Adolescent Health Care of the First Department of Pediatrics at the Aghia Sophia Children’s Hospital in Athens, Greece. To determine a sample size sufficient for factor analytic procedures, the following two criteria were used: (i) the sample should have 51 more cases than the number of variables to support chi-square testing in Bartlett’s test of sphericity (Lawley and Maxwell, 1971; Gorsuch, 1983), (ii) the sample should include at least 100 cases and the subjects to variables (STV) ratio should be no less than 5 (Suhr, 2006; Hatcher, 1994).

Inclusion and exclusion criteria

Teenagers, 12- to 18-years of age, able to read and write in Greek, were eligible to participate in the study. Adolescents with major psychiatric disorders or other chronic diseases known to affect sleep, and substance users were excluded.

Adolescents and their parents or guardians were informed about the purpose of the study and signed consent forms prior to study entry. The study protocol was approved by the ethics committee of the Aghia Sophia Children’s Hospital. The entire survey (translation, pilot, and main study) was conducted from December 2017 to December 2018.

Validation Procedure

Trying to achieve an excellent and unbiased translation for the instrument, multiple techniques were used as proposed for cross-cultural research, namely forward translation, backward translation, expert committee review and preliminary pilot testing (Tsang et al., 2017; Hallet et al., 2018). During the forward translation procedure, two bilingual (Greek and English) translators worked independently to produce a Greek version of the ASHS. Some minor discrepancies among the two translators were resolved by an independent reviewer.
During the backward translation procedure, the version that was produced in the previous step was back translated in English by two bilingual translators experienced in the target culture and who had never seen before the original English version of the scale. Following this, a source-language questionnaire developer highlighted each word or phrase that was discrepant. An expert committee that included a member with in-depth knowledge of adolescent health and an expert in research methodology and translation process, solved some minor discrepancies and a consensus was reached. Examining feasibility was the last stage of the cross-cultural adaptation process before producing the final version of the Greek version of ASHS. A group that included eight healthy adolescents, aged 12-18 years, was recruited to contribute to the preliminary pre-testing of the translated version and to ensure the original instructions, items and scoring materials were clearly expressed. The last step of pilot testing involved the questionnaire completion with an aim to explore how adolescents interacted and completed the instrument. Twenty adolescents were recruited to pilot testing of the investigated tool. This step provided an opportunity to investigate the wording of the instructions, the understanding of the items, and the way of completion with the provided response scale. Moreover, in this stage, there was an opportunity of recording the time that participants needed to fill in the questionnaire.

Materials
Study participants were asked about their demographic characteristics, as well as to complete the following two tools:

Adolescent Sleep Hygiene Scale (ASHS): The Adolescent Sleep Hygiene Scale (ASHS) was initially constructed by LeBourgeois (LeBourgeois et al., 2005) and was modified from the Children's Sleep Hygiene Scale (Harsh et al., 2002). The ASHS is a 28-item self-report tool that assesses sleep-facilitating and sleep-inhibiting practices in 12- to 18-year-old adolescents along 9 different conceptual domains: physiological (5 items), cognitive (6 items), emotional (3 items), sleep environment (4 items), daytime sleep (1 item), substances (2 items), bedtime routine (1 item), sleep stability (4 items), and bed/bedroom sharing (2 items) (LeBourgeois et al., 2005). Participants report how often behaviours related with sleep hygiene have occurred during the past months using a 6-point Likert scale (1=“always,” 2=“frequently-if not always,” 3=“quite often,” 4=“sometimes,” 5=“once in a while,” 6= “never”). The original measure had a good reliability index and more specifically the Cronbach’s Alpha reliability index for the whole scale (total ASHS) (LeBourgeois et al., 2005).

Adolescent Stress Questionnaire (ASQ): The Adolescent Stress Questionnaire (ASQ) consists of 58 questions related to the stress of the adolescent in the last year (Byrne et al., 2007). The ASQ has been translated and validated in the Greek population (Darviri et al., 2017). The 58 items in the Greek validation were categorised into 10 conceptual areas: stress of home life (12 items), school performance (7 items), school attendance (3 items), romantic relationships (5 items), peer pressure (7 items), teacher interaction (7 items), future uncertainty (3 items), school/leisure conflict (5 items), financial pressure (4 items), and emerging adult responsibility (3 items). The Greek validation showed a good reliability index and, more specifically, Cronbach’s alpha internal consistency for the mentioned scales ranged from 0.70 to 0.86 and was equal to 0.96 for the whole scale (total ASQ) (Darviri et al., 2017). The present study showed a good internal consistency and, in particular, Cronbach’s alpha for ASQ scales ranged from 0.66 to 0.90.

Statistical analysis
Data analysis was conducted using the SPSS statistical software version 25 (IBM Corp. Released 2017. IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY: IBM Corp.). All variables of the study were calculated with descriptive analyses including mean, standard deviation (SD), absolute and relative frequencies. Exploratory Factor Analysis (EFA) with a Varimax rotation was conducted. Internal consistency was assessed using Cronbach’s alpha. Convergent validity was examined by undertaking Spearman rho correlation.

Table 1. Demographic characteristics of study participants.

| Characteristics          | Total sample (N=146) |
|--------------------------|----------------------|
|                          | N (%)                |
| Gender                   |                      |
| Male                     | 51 (34.9)            |
| Female                   | 95 (65.1)            |
| Educational Stage        |                      |
| Junior High School       | 91 (62.3)            |
| High School              | 55 (37.7)            |
| Maternal Education level |                      |
| Up to secondary          | 62 (42.5)            |
| University degree        | 58 (39.7)            |
| Postgraduate studies     | 26 (17.8)            |
| Paternal Education level |                      |
| Up to secondary          | 65 (44.5)            |
| University degree        | 54 (37.0)            |
| Postgraduate studies     | 27 (18.5)            |
| Mean ± SD                |                      |
| Age (years)              | 14.43 ± 1.90         |

Qualitative variables are presented as absolute and relative frequencies and quantitative variable (age) as mean ± standard deviation (SD).
Table 2. Exploratory factor analysis of items of Adolescent Sleep Hygiene Scale (ASHS) after varimax rotation using principal components (N=146).

| Psychological | Factors | 1   | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9   |
|---------------|---------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| After 6:00 pm, I have drinks with caffeine (for example: cola, pop, root beer, iced tea, coffee). | -0.051 | 0.188 | 0.676 | 0.130 | 0.210 | 0.226 | 0.047 | 0.111 | 0.001 |
| During the 1 hour before bedtime, I am very active (for example: playing outside, running, wrestling). | -0.125 | 0.142 | 0.094 | 0.012 | 0.006 | 0.723 | -0.193 | -0.007 | 0.085 |
| During the 1 hour before bedtime, I drink >4 glasses of water (or some other liquid). | 0.117 | -0.078 | 0.032 | 0.058 | 0.020 | 0.787 | 0.053 | 0.002 | -0.164 |
| I go to bed with a stomachache. | 0.446 | 0.017 | -0.137 | -0.077 | 0.582 | 0.012 | -0.130 | 0.182 | -0.010 |
| I go to bed feeling hungry. | 0.076 | 0.155 | 0.207 | 0.002 | 0.597 | -0.181 | -0.066 | -0.054 | -0.229 |
| Cognitive | | | | | | | | | |
| During the 1 hour before bedtime, I do things that make me feel very awake (for example: playing video games, watching television, talking on the telephone). | 0.074 | 0.728 | -0.072 | 0.192 | 0.007 | 0.055 | 0.123 | 0.049 | 0.075 |
| I go to bed and do things in my bed that keep me awake (for example: watching television, reading). | 0.085 | 0.596 | 0.228 | 0.425 | 0.140 | -0.073 | -0.152 | 0.184 | 0.238 |
| I go to bed and think about things I need to do. | 0.711 | 0.020 | 0.269 | 0.245 | 0.008 | -0.053 | 0.036 | 0.039 | 0.072 |
| I go to bed and replay the day's events over and over in my mind. | 0.795 | 0.013 | -0.053 | 0.117 | -0.056 | 0.137 | 0.190 | 0.026 | 0.021 |
| I use my bed for things other than sleep (for example: talking on the telephone, watching television, playing video games, doing homework). | 0.103 | 0.537 | 0.170 | 0.372 | 0.059 | 0.196 | 0.164 | -0.082 | -0.090 |
| I check my clock several times during the night. | 0.116 | 0.680 | 0.107 | -0.122 | 0.024 | -0.070 | 0.130 | -0.009 | -0.060 |
| Emotional | | | | | | | | | |
| During the 1 hour before bedtime, things happen that make me feel strong emotions (sadness, anger, excitement). | 0.528 | 0.536 | 0.067 | -0.144 | 0.213 | 0.080 | 0.035 | -0.124 | 0.010 |
| I go to bed feeling upset. | 0.480 | 0.386 | 0.170 | -0.190 | 0.214 | -0.042 | -0.022 | -0.038 | -0.129 |
| I go to bed and worry about things happening at home or at school. | 0.703 | 0.323 | 0.117 | -0.187 | 0.106 | -0.110 | -0.102 | 0.055 | -0.108 |
| Sleep environment | | | | | | | | | |
| I fall asleep while listening to loud music. | 0.042 | 0.133 | 0.079 | 0.570 | 0.052 | 0.027 | 0.103 | 0.005 | -0.319 |
| I fall asleep while watching television. | -0.009 | 0.066 | 0.024 | 0.794 | 0.044 | 0.000 | 0.083 | -0.172 | -0.085 |
| I fall asleep in a brightly lit room (for example, the overhead light is on). | -0.245 | -0.046 | -0.039 | 0.383 | 0.499 | 0.190 | 0.144 | -0.158 | 0.069 |
| I fall asleep in a room that feels too hot or too cold. | -0.055 | 0.290 | 0.337 | 0.234 | 0.432 | 0.023 | 0.247 | 0.027 | -0.369 |
| Daytime sleep | | | | | | | | | |
| During the day I take a nap that lasts > 1 hour. | 0.203 | -0.054 | 0.367 | -0.013 | 0.494 | 0.303 | 0.078 | -0.072 | 0.200 |
| Substances | | | | | | | | | |
| After 6:00 pm, I smoke or chew tobacco. | 0.203 | 0.086 | 0.641 | -0.146 | 0.055 | -0.104 | 0.200 | -0.079 | -0.359 |
| After 6:00 pm, I drink beer (or other drinks with alcohol). | 0.143 | 0.061 | 0.784 | 0.079 | 0.040 | -0.010 | -0.011 | 0.027 | 0.053 |
| Bedtime routine | | | | | | | | | |
| I use a bedtime routine (for example, bathing, brushing teeth, reading). | -0.018 | 0.070 | 0.007 | -0.195 | -0.017 | -0.071 | 0.061 | -0.063 | 0.773 |
| Sleep stability | | | | | | | | | |
| During the school week, I stay up >1 hour past my usual bedtime. | 0.002 | 0.288 | 0.195 | 0.174 | 0.462 | 0.046 | 0.320 | 0.054 | 0.302 |
| During the school week, I "sleep in" >1 hour past my usual wake time. | 0.080 | -0.065 | 0.445 | 0.424 | -0.023 | 0.299 | 0.108 | 0.072 | 0.223 |
| On weekends, I stay up >1 hour past my usual bedtime. | 0.083 | 0.194 | 0.026 | 0.178 | 0.016 | -0.052 | 0.714 | -0.090 | 0.067 |
| On weekends, I "sleep in" >1 hour past my usual wake time. | 0.009 | 0.048 | 0.105 | 0.011 | 0.024 | -0.051 | 0.763 | 0.172 | -0.038 |
| Bed/Bedroom sharing | | | | | | | | | |
| I sleep alone. | 0.040 | -0.101 | 0.087 | 0.037 | -0.043 | -0.123 | 0.006 | 0.868 | 0.036 |
| I sleep all or part of the night with someone else (for example, with your parent[s], sister, or brother). | -0.030 | -0.173 | 0.019 | 0.313 | -0.034 | -0.180 | -0.132 | -0.716 | 0.129 |
| Loadings | 2.60 | 2.56 | 2.29 | 2.13 | 1.78 | 1.61 | 1.57 | 1.50 | 1.38 |
| Variance explained | 9.28 | 9.13 | 8.17 | 7.59 | 6.34 | 5.75 | 5.59 | 5.34 | 4.93 |

Five factors explaining 62.1% of the total variance; Kaiser-Meyer-Olkin (KMO) = 0.700; Bartlett’s Test of Sphericity: p < 0.001. Bold values indicate factor loading of greater than 0.3. Cronbach’s alpha of total scale: a = 0.78.
Results

Pilot study

Upon completion of the translation procedure, a pilot study was conducted among 20 adolescents. There was no difficulty by the students in completing the tool, neither in marking nor in the questions. The reliability index in the pilot study was found to be equal to Cronbach’s α = 0.73 and was considered satisfactory (Houser, 2008).

Main study

The sample of the main study consisted of 146 Greek adolescents. Descriptive statistics of the demographic and other characteristics of the sample are presented in Table 1.

About 2 of 3 participants were female (65.1%) and 34.9% of the participants were males. The majority of the sample was studying in junior high school (62.3%) and 37.7% in high school. The maternal education level was up to secondary level for 42.5% of the participants’ mothers, 39.7% had university degrees and 17.8% had postgraduate studies. The paternal education level was up to secondary level for 44.5% of the participants’ mothers, 37.0% had university degrees and 18.5% had postgraduate studies. The age of participants ranged from 12 to 18 years with a mean age of 14.43 years (SD=1.90), which also was gender-matched (p=0.650).

Factor analysis was performed, and the initial nine factors were extracted (Table 2). The total variance explained by EFA was found as 62.1%. The internal consistency of the Greek version of ASHS carried out using Cronbach’s alpha coefficient was α = 0.77 for the total scale.

The Psychological scale was split into two factors indicating that the construct validity of this scale was not supported totally. The first item about drinking caffeine in the afternoon did not load better to this factor, but it was loaded in the factor with other substances. The other two items in the Substances scale (tobacco and alcohol drinks) matched perfectly into the same factor. Cognitive scales’ items were divided in two factors (two out of six loaded in other factors). The Emotional scale’s item perfectly loaded in the initial component. Three out of four items of the Sleep Environment scale loaded together in one factor, except for the item “I fall asleep in a room that feels too hot or too cold” which loaded higher in other factors. The Daytime scale had only one item which consisted the fifth component of the table. Three out of four items of the Sleep Stability scale loaded together in one factor, except for the item “During the school week, I “sleep in” >1 hour past my usual wake time” which loaded higher in other factors. The last scale of Bed/Bedroom Sharing was extracted in one factor with the last item showing a negative load which indicated reverse item.

Convergent validity

To prove convergent validity, Spearman’s correlation coefficients were calculated between ASHS and ASQ scales. Positive but not strong correlations were found between these two tools. Strongest correlations were found between Emotional (ASHS) and Stress of Home Life (ASQ) (rs = 0.461, p< 0.001) (Table 3).

Discussion

The aim of the present study to validate the ASHS was accomplished as confirmatory and reliability analyses were supportive of a valid tool, while our findings were comparable with other studies that have used this measure (Galland et al., 2017; de Bruin et al., 2014; Alfiyah et al., 2018). The main difference proposed in this
study is the item concerning caffeine to be moved to the Substance use scale.

In young people, a large percentage with symptoms of an anxiety disorder also have problematic sleep habits (Telzer et al., 2014). One of the main lifestyle factors that affect adolescence is sleep, while adolescents tend to sleep late and want to stay up late, even on weekdays (Kirov et al., 2017). The transition from childhood to adolescence affects a young person in many areas of life and to a great extent. Teenagers’ feelings and the way they experience the changes in their life are more intense, therefore they experience the stress that these changes can bring to a greater degree. Research conducted in America has shown that adolescent sleep is also affected by the situation at home, such as stress and parental depression (Schmeer et al., 2018). The same result was found in the present study where stress factors caused by living at home significantly affected sleep habits, i.e. it was found that as stress due to the teenager’s home increases, so does poor sleep hygiene. Our results demonstrated a statistically significant correlation between stress and sleep quality in adolescents.

In conclusion, the Greek version of the ASHS constitutes a valid measure of the adolescent sleep hygiene, as the tool allows adolescents to report their own sleep-facilitating and sleep-inhibiting practices, adding to current knowledge and aiding future research in the field of adolescent health.

Key Points

- Sleep is one of the major lifestyle factors that affect adolescent physical and mental health.
- The Adolescent Sleep Hygiene Scale (ASHS) was validated in an adolescent sample living in Greece.
- ASHS is a reliable and valid tool for evaluating sleep-facilitating and sleep-inhibiting practices of Greek adolescents.

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