**Development and assessment of**

**Outcomes of Poor Sleep– scale (OOPS-s I): Relationship of Poor Sleep Outcomes and Behavioral activation, Depression, Anxiety, Stress and Quality of Life among the general population.**

**Abstract**

Sleep difficulties are common, yet proper sleep routines are often neglected. Effective monitoring tools are needed for psychotherapeutic work and research. This study aimed to develop a comprehensive, time-sensitive scale for use in public health and therapeutic settings. The Outcomes of Poor Sleep I (OOPS-s I) scale, based on the Cognitive Behavioral and Two-Process models of sleep, was developed from 44 items reflecting sleep deprivation and insomnia outcomes.

Using a sample of 545 participants, multiple exploratory factor analyses, internal consistency, and correlation analyses were conducted. The final 32-item scale identified four factors: 1. Poor sleep and distress, 2. Sleepiness and fatigue, 3. Sleep compensation, and 4. Impaired sleep-wake routine. These factors align with existing research. The scale demonstrated moderate to high reliability (α =.69 to α =.94) and significant correlations with measures of pre-sleep arousal, cognitive and somatic symptoms, sleep locus of control, depression, anxiety, stress, life satisfaction, and behavioral activation. The OOPS-s I scale is a reliable tool for measuring various outcomes of acute sleep disturbances. These findings suggest potential targets for therapeutic or medical intervention.

Key words: poor sleep routines, arousal, distress, well-being

**Highlights**

* The item pool of Outcomes of poor sleep (OOPS) based on the Cognitive-behavioral model and The extended two - process model of sleep difficulties was composed.
* Exploratory factor analysis, item reliabilities of factor solutions and correlations with theoretically relevant constructs were conducted.
* The four factor solution was shown to reflect the best grouping of the OOPS items, which were named Poor sleep and distress, Sleepiness and fatigue, Sleep compensation and, Impaired sleep-wake routine demonstrated moderate to high internal consistencies.
* All of the examined factors formed significant correlations with relevant constructs.
* Outcomes of poor sleep scale developed in this study was shown to be an adequate instrument for measuring different types of poor sleep outcomes.

**Introduction**

Sleep is a naturally occurring, reversible state of reduced awareness and responsiveness (Carskadon & Dement, 1989). In psychotherapy, it's viewed as a bio-behavioral process (Skinner, 1953; Blumpied & Bootzin, 2013) that can be modified by activity levels, temperature, wakefulness duration, and cues like light and muscle tone. Stress levels (Kim & Dimsdale, 2007) and the absence of competing behaviors (e.g., late-night socializing) also impact sleep. Four neurophysiological systems sustain sleep: homeostatic (process S), circadian (process C), sleep inertia (process W), and arousal systems (Lockley and Forster, 2012; Borbély et al., 2016; Kalmbach et al., 2020). Dysregulation in these systems can lead to fragmented sleep, chronic insomnia, and sleep-wake disorders. Sleep difficulties are widespread (Dinges et al., 1997). Even one night of poor sleep can impair cognitive functioning and mood, with effects worsening after three consecutive nights (Dinges et al., 1997; Lee, 2022). Poor sleep amplifies threat detection, stress, and task performance (Grèzes et al., 2021; Ma et al., 2015). During the COVID-19 pandemic, about half of young adults in the Western Balkans had impaired sleep (Šljivo et al., 2022), and 43% of Serbian students suffer from poor sleep (Višnjić et al., 2020). Over one-third of Europeans report poor-quality sleep due to anxiety and financial concerns (Stada, 2022). Poor sleep contributes to road and workplace accidents (Léger et al., 2014) and several major causes of death in the U.S. (Kochanek et al., 2014). Good sleep quality is crucial for mental health, while poor sleep is linked to various mental health issues (Kleim et al., 2014; Scott et al., 2021; Yager, 2021).

*Poor Sleep Outcomes*

Poor sleep is defined as a subjective assessment of an individual that sleep quality and quantity are not satisfactory (Stores, 2009; Herawati & Gayatri, 2019; Serrano-Checa et al., 2020; Nelson, Davis, & Corbett, 2021). It is defined as a typical outcome of the two contextually relevant scenarios, 1. The individual doesn’t have the opportunity, but wants to sleep (sleep deprivation) and/or 2. The individual has the opportunity, but can’t sleep (insomnia) (Bonnet, & Arand, 2003; Arand & Bonnet, 2023; Cirelli, 2024). While most authors agree that both scenarios result in similar outcomes (Roth & Roehrs, 2003; Herawati & Gayatri, 2019; Sharath & Loganathan, 2022), sleep deprivation in most cases unlike insomnia, affects functionality and cognitive clarity (Kim et al., 2018) to the greater extent (McNamara, Barton, & Nunn, 2010). Unlike insomnia, where an individual has the opportunity but cannot sleep, sleep deprivation occurs when there isn't enough opportunity to sleep. It can last from a few days to years until compensatory sleep is achieved. Nevertheless, poor sleep outcomes result from both deprivation and insomnia related difficulties and connote the failure to maintain sleep quality and/or continuity (Višnjić et al., 2020). This can affect the outcomes of psychotherapy (Zalta et al., 2013; Scott et al., 2021; Jensen et al., 2022).

*Study Aims*

This study aimed to develop a comprehensive, time-sensitive scale for public health and therapeutic use. It targets poor sleep outcomes related to psychological difficulties from any sleep-related issues. While objective measures like polysomnography and actigraphy are effective, screening tools and questionnaires are practical (Ali et al., 2020) developing and using psychological instruments for assessing poor sleep outcomes is both essential and cheaper for monitoring subjective sleep difficulties and their effects on well-being (Hughes et al., 2017; Ibáñez, Silva, & Cauli, 2018). Poor sleep outcomes are expected to relate significantly to pre-sleep arousal, depression, anxiety, stress, life satisfaction, behavioral activation, and sleep locus of control (Ali et al., 2020; Espie et al., 2014; Fernandez-Mendoza et al., 2015; Gómez-Benito et al., 2011; Jansson-Fröjmark & Boersma, 2012; Kato, 2014; Tang & Harvey, 2004; Tibubos et al., 2020; Wolińska et al., 2022; Yarlas et al., 2021).

**Methods**

**Sample characteristics**

The Pre-sleep arousal, Sleep locus of control, and items for Outcomes of poor sleep scale were translated by a professional anglicist. Inclusion criteria for this study required for individuals: 1. To be at least 18 years old, 2. To have the ability to communicate in Serbian, and 3. To have written informed consent to participate in the study. 545 subjects were tested using the snowballing method by the recruited students at Union University, ranging from 18 to 75 years old (M=35 years old; SD=.49). By conducting the frequency analysis, the results show that the total sample was composed of 545 participants (Nfemales=335 or 62%, Nmales=210 or 38% of the sample), with 361 participants currently employed, 169 currently unemployed, and 15 volunteers. It was shown that 142 participants work 8 hours every day with the fixed shift routine, 50 participants 8 hours every day with a variable shift routine and hourly rate, 47 participants work 8 hours every day sometimes with 2 shifts in a row, 52 participants work less than 8 hours a day, and 94 have flexible routine when it comes to timing and duration of the working hours. Additionally, 158 participants are currently retired or unemployed. 38,1% of participants describe their incomes as “satisfying”, 56,4% as “moderate” and 5,5 % as “poor”.

**Procedure**

The research was approved by the ethical committee of the Faculty of Business and Legal Studies, “Dr Lazar Vrkatić” Union University. It was conducted in accordance with the Helsinki declaration of ethical principles in research involving human participants. The students were given credits for participation, and were instructed to provide an informative pamphlet about contacts for free psychological health regarding sleep and emotional difficulties.

**Instruments**

**Outcomes of poor sleep scale**

The item pools were formulated by several different sleep-relevant dimensions: sleep pattern routine (“... I would sleep in to compensate for my lack of sleep.”; “... I went to bed early in order to get more sleep.”), daily functioning (“... I felt that my life was being wasted due to my lack of sleep.”), satisfaction about sleep (“... I was satisfied with how much sleep I got.”), distress (“... I was irritated that I couldn’t fall asleep.”), poor sleeper identity (“... I started to think something is wrong with me because I can’t get enough sleep.”), inertia (“... I would wake up tired and restless.), subsequent daily tiredness (“... I would get tired quickly due to my lack of sleep.”). This is similar to the earlier models and examples for good sleep difficulties scale development suggestions (Spoormaker et al., 2005). In order to detect sensitive changes in these dimensions of sleep, it is focused on measuring poor sleep outcomes “…during the previous two weeks”. The span of two weeks encompasses all the relevant psychological changes such as cognitive difficulties and performance, mood changes, that are related to the sleep debt accumulation which can affect the dysregulation of the sleep-wake cycle pattern itself (Banks & Dinges, 2007; Dinges et al., 1997; McEwen & Karatseores, 2022; Peng et al., 2020; Scott et al, 2006; Van Dongen et al., 2003; Zohar et al., 2005). A four-step scale of progressive responses was provided for answers. (“Not at all, or never” …” Almost always, or completely”).It contains a 4 level scale with responses ranging from “Not at all or never” to “Almost always or completely”, and five items are coded inversely. Higher scores indicate higher level of disturbances except on four items that are reversely coded. The English and Serbian scale versions are provided in Supplementary File’s 1 and 2.

**Pre-sleep arousal scale**

The Pre-sleep Arousal Scale (PSAS; Nicassio et al., 1985) was used to assess the cognitive and somatic types of arousal before sleep onset and during the night. PSAS consists of 16 items and 5 point Likert scale for responses (“1-Not at all” … “5-Extremely”). Higher scores indicate greater cognitive and somatic symptoms of arousal. It was shown to form significant relationship with theoretically relevant concepts such as sleep reactivity, stress, arousability, neuroticism, depression, anxiety, wake after sleep onset and early morning awakenings (Ruivo Marques et al., 2018; Jansson-Fröjmark & Norell-Clarke, 2012). The permission to use and to translate this scale to Serbian was granted by the author. The internal consistency of the translated version was shown to be α=.90.

**Sleep Locus of Control Scale**

Sleep Locus of Control Scale (SLCS; Vincent et al., 2004). The scale contains the 8 items and responses ranged on a 6 level scale (1 - “Strongly disagree” … 6 - “Strongly agree” ).The sleep locus of control represents the degree to which an individual believes that their sleep quality is influenced by external or internal factors (Shahid et al., 2011; Vincent et al., 2004). It was shown to forma significant relationship with insomnia, sleep effort, sleep quality depression and anxiety (Igbokwe, 2021; Vieira et al., 2023). The permission to use and translate this scale to Serbian was granted by the author. The internal consistency of the translated version was shown to be α=.67.

**Depression, anxiety and stress**

Depression, anxiety and stress scale (DASS-21; Lovibond & Lovibond, 1995). It encompasses distress measures such as irritability, excess worry, panic experiences, tension, somatic and cognitive experiences of depressiveness, anxiety and stress. The Serbian version of this scale has been shown to be highly reliable, valid, and it is widely used on various different samples in Serbian- speaking areas (Jovanović et al., 2014; Mihić et al., 2014; Opanković et al., 2021)

**Satisfaction with life**

The Satisfaction With Life Scale (SWLS; Diener et al., 1985) was used to assess the levels of general satisfaction with life among participants. It is composed of 5 items and participants respond on a 7 point scale (“7 – strongly agree”…”1- strongly disagree”) to how much they agree or disagree to the statements which represents a judgemental component of life satisfaction. Higher scores indicate greater satisfaction with life. The scale was validated for the use among Serbian adolescents (Jovanović, 2016).

**Behavioral activation**

The Behavioral Activation for Depression Scale - short version (BADS; Manos et al., 2011; Kanter et al., 2007) was used to measure engagement in fulfilling life activities on a weekly basis among participants. 9 items are included in this scale with responses ranging from “0 - Not at all”…”6 - Completely”. Since the data indicate that item no. 1 does not saturate the Activation factor (Miladinović & Mitić, 2022; Wagener et al., 2015), and due to poor performance in this research, the item no.1 was excluded from the analysis. The behavioral activation for depression scale was shown to be reliable and its components Activation and Avoidance were shown to correlate with Mindful attention and awareness and Depressiveness (Miladinović & Mitić, 2022).

**Analysis and criteria**

For the purpose of further analysis, IBM 25.0 SPSS was used to conduct missing value and imputation analysis, frequency analysis for sample characteristics, exploratory factor analysis, parallel analysis, internal consistency analysis, and pearson correlations. According to the suggestions, the number of factors to be retained in further analysis is based on their eigenvalues being higher than 1, depending on the breaking points of scree test, and depending on the results of parallel analysis. Oblique rotation will be set for the clarification of factor patterns, which is widely regarded as the preferred method (Costello & Osborne, 2005; Field, 2020). The magnitude of correlations will be interpreted according to Evans’s criteria: .00-.19 is considered “very weak”, .20-.39 is considered “weak”, .40-.59 is considered “moderate”, .60-.79 is considered “strong” and .80-1.0is considered “very strong”(Evans, 1996). Significance levels of less than 0.05 were taken into account. Internal consistency, exploratory and confirmatory factor analysis as well as regression analysis, were conducted to assess the psychometric properties of the instrument, significant correlations with theoretically and conceptually linked constructs (Winter, 2018), and the psychometric properties of the OOPS-scale .

**Results**

*Missing values, imputation and sample characteristics.* After performing the MCAR test it was concluded that the difference between the missing values was not significant (p=.076). No pattern was detected, and the missing values were concluded to be random. The imputation was done by the automatic method.

*Results of exploratory factor analysis.*

The absence of the cases with .90 and .80 values of correlations between the items suggested that the collinearity assumption was not violated. Considering that the KMO value for the measurement of sample adequacy was shown to be 0.95, along with the Bartlett test of sphericity results (p < 0.001), and anti-image correlation results (most of the values of items being around and between .90 and .80), it was concluded that variables form a significant correlation and that factor analysis should be applied. The principal component analysis was applied as an extraction method. Items 3, 12,13,16,19,36 and 39 were shown to be slightly below the more strictly recommended threshold (oops\_s3=0.49; oops\_s12=0.46 oops\_s13=0.49: oops\_s16=0.41; oops\_s19=0.41; oops\_s36=0.45; oops\_s39=0.44). Up to this point, all items were kept in accordance with the less restrictive recommendations for standardized values being greater than 0.40 (Gómez-Benito et al., 2011). Eigenvalues were inspected (>1.) and it was shown that the total variance was almost 60% (59.9%) explained by 7 factors. An indication that a four-factor solution should be adopted was provided after inspecting the percentiles of random eigenvalues of the randomized parallel analysis (Patil et al., 2008). Those values were higher than those of total eigenvalues in our data. Additional exploratory factor analysis was conducted using promax rotation. Eigenvalues were inspected (>1.) and it was shown that the cumulative percentage of variance was 52% explained by 4 factors, which were kept for further investigation. the factors were named 1. Poor sleep and distress, 2. Sleepiness and fatigue, 3. Sleep compensation, 4. Impaired sleep-wake routine, Poor sleep and distress as the first dimension were shown to explain the most of the reported variance. List-wise deletion was applied. Twelve items were excluded (oops\_4 “I couldn’t focus on important daily activities because I didn’t get enough sleep.”; oops\_11 “I didn’t have the energy to perform daily tasks because of my poor sleep.”; oops\_ 13 “My lack of sleep made me feel hungover.”; oops\_s16 “I knew what to do in order to get a good night’s sleep . (R)”; oops\_19 “I slept during the day in order to compensate for my lack of sleep.” ; oops\_25... “I went to bed early in order to get more sleep.”;oops\_26...“I avoided various daily activities because I was tired.”;oops\_27...“I would get tired quickly due to my lack of sleep”; oops\_29...”I felt disoriented upon waking up.”; oops\_s33“... I had trouble carrying on with my daily activities due to fatigue.”;oops\_34... “I slept shorter than usual.” andoops\_s39“…I would measure the hours I have remaining to get proper sleep.”. The results are presented in **Table 1.**

| **Table 1.**  *Pattern Matrixfor the factors of the OOPS scale* | | | | |
| --- | --- | --- | --- | --- |
|  | *Component* | | | | |
| ***PSAD*** | ***SAF*** | ***SC*** | ***ISWR*** | |
| 1... I was satisfied with how much sleep I got. (R) |  | .587 |  |  | |
| 2... Fatigue prevented me from doing things that are important to me. |  | .452 |  |  | |
| 3... I wasn’t sure whether I was asleep or awake for most of the night. | .487 |  |  |  | |
| 4... I couldn’t focus on important daily activities because I didn’t get enough sleep. |  |  |  |  | |
| 5... I felt fatigue in my body when I was supposed to wake up. |  | .786 |  |  | |
| 6... I was irritated that I couldn’t fall asleep. | .551 |  |  |  | |
| 7... I would wake up tired and restless. |  | .905 |  |  | |
| 8...I spent most of the day feeling tired and sleepy. |  | .805 |  |  | |
| 9... I was satisfied with the quality of my sleep. (R) |  | .642 |  |  | |
| 10…I felt fresh and well rested upon waking. (R) |  | .935 |  |  | |
| 11... I didn’t have the energy to perform daily tasks because of my poor sleep. |  |  |  |  | |
| 12... I was irritated that others have no trouble falling asleep and sleeping. | .649 |  |  |  | |
| 13... My lack of sleep made me feel hungover. |  |  |  |  | |
| 14... I felt a strong urge to get a good night‘s sleep. |  | .581 |  |  | |
| 15... I felt that my body was heavy when I was supposed to get out of bed. |  | .697 |  |  | |
| 16... I knew what to do in order to get a good night’s sleep . (R) |  |  |  |  | |
| 17... Upon waking up, it took me some time to feel fresh and properly awake. |  | .436 |  |  | |
| 18... I went to bed at different times. |  |  |  | .668 | |
| 19... I slept during the day in order to compensate for my lack of sleep. |  |  |  |  | |
| 20... I felt very tired during the day. |  | .693 |  |  | |
| 21... I started to think something is wrong with me because I can’t get enough sleep. | .771 |  |  |  | |
| 22... My lack of sleep worried me. | .833 |  |  |  | |
| 23... I tried to relax in order to fall asleep, but without success. | .802 |  |  |  | |
| 24... I woke up at different times. |  |  |  | .709 | |
| 25... I went to bed early in order to get more sleep. |  |  |  |  | |
| 26... I avoided various daily activities because I was tired. |  |  |  |  | |
| 27... I would get tired quickly due to my lack of sleep. |  |  |  |  | |
| 28... I felt hopeless because I couldn't get enough sleep. | .658 |  |  |  | |
| 29... I felt disoriented upon waking up. |  |  |  |  | |
| 30... I felt that I had lost my ability to get proper sleep. | .712 |  |  |  | |
| 31... I slept longer than usual. |  |  | .548 |  | |
| 32... I would sleep in to compensate for my lack of sleep. |  |  | .600 |  | |
| 33... I had trouble carrying on with my daily activities due to fatigue. |  |  |  |  | |
| 34... I slept shorter than usual. |  |  |  |  | |
| 35... I was beginning to lose hope that I would get proper sleep. | .780 |  |  |  | |
| 36... I felt discomfort upon going to bed, which made it difficult to fall asleep. | .580 |  |  |  | |
| 37... It took me a long time to wake up. |  | .477 |  |  | |
| 38... I felt that my life was being wasted due to my lack of sleep. | .413 |  |  |  | |
| 39... I would measure the hours I have remaining to get proper sleep. |  |  |  |  | |
| 40... I usually went to bed and got up at the same periods from day to day. (R) |  |  |  | .600 | |
| 41... It took me a long time to fall asleep. | .683 |  |  |  | |
| 42... I felt angry because I couldn’t get enough sleep. | .707 |  |  |  | |
| 43... I was worried about my health because I didn’t sleep well. | .734 |  |  |  | |
| 44... I would wake up in the middle of the night and have difficulty falling back asleep. | .759 |  |  |  | |
| Table 1. Extraction Method: Principal Component Analysis. Rotation Method: Promax with Kaiser Normalization. Abbreviations. PSAD - Poor sleep and distress; SAF - Sleepiness and fatigue; SC - Sleep compensation; ISWR-Impaired Sleep-wake routine; x - no significant loadings per factor was detected; Note: There were no cross-loadings detected. | | | | |

*Internal consistency analysis.* With the aforementioned exclusion Cronbach alpha coefficients were shown to be very high to moderate for every tested measure including total Outcomes of poor sleep score (α=.94),Poor sleep and distress(α=.93),Sleepiness and fatigue(α=.91),Sleep compensation(α=.69), Impaired sleep-wake routine(α=.77).

*Correlation analysis.* Outcomes of poor sleep total score was found to be significantly related to all of the retained factors Poor sleep and distress (r=.92; p <0.001), Sleepiness and Fatigue (r=.85; p <0.001), Sleep compensation (r=.41; p <0.001), Impaired sleep-wake routine (r=.33; p <0.001). Outcomes of poor sleep, Poor sleep and distress, and Sleepiness and fatigue formed a very weak but significant correlation with levels of income (r=.11; p <0.01; r=.09, p <0.05; ; r=.13, p <0.001), whilst Impaired sleep-wake routine was significantly related to the drinking alcohol (r=.13, p <0.001). Additionally it was shown that status of employment (Outcomes of poor sleep r=.19 p < 0.001;Poor sleep and distress r=.17 , p <0.001 and Sleepiness and fatigue r=.13 p <0.001; Sleep compensation r=.16 p <0.001; and Impaired sleep-wake routine r=.25, p <0.001) and age (Outcomes of poor sleep r=-.12 p < 0.001; Sleepiness and fatigue r=-.21 p <0.001; Sleep compensation r=-.21 p <0.001; and Impaired sleep-wake routine r=-.25, p <0.001) form significant correlation with Outcomes of poor sleep components.

| Table 2.  *Correlations* | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | | | ***PSA*** | | ***PSAC*** | | | | ***PSAS*** | | | ***SLCC*** | | | ***SLCI*** | | | | ***SWLS*** | | | ***STR*** | | | | ***A*** | | | ***D*** | | | | ***DST*** | | | | ***BADS*** | | | ***AV*** | | | | ***ACT*** | | | | |
| **OOPS** | Pearson Correlation | .679\*\* | | .590\*\* | | | | .722\*\* | | | .165\*\* | | | -.053 | | | | -.301\*\* | | | .588\*\* | | | .560\*\* | | | | .577\*\* | | | | .646\*\* | | | | -.508\*\* | | | .482\*\* | | | -.325\*\* | | | | |
|  |  | |  | | |  | | | |  | | |  | |  | | | |  | | | | |  | | | | |  | | | |  | | |  | | | |  | | | | | | |
| **PSAD** | Pearson Correlation | .637\*\* | | .579\*\* | | | | .691\*\* | | | .213\*\* | | | -.061 | | | | -.264\*\* | | | .532\*\* | | | .513\*\* | | | | .514\*\* | | | | .584\*\* | | | | -.460\*\* | | | .438\*\* | | | -.294\*\* | | | | |
|  |  | |  | | | |  | | |  | | |  | | | |  | | |  | | |  | | | |  | | | |  | | | |  | | |  | | |  | | | | |
|  |  | |  | | | |  | | |  | | |  | | | |  | | |  | | |  | | | |  | | | |  | | | |  | | |  | | |  | | | | |
| **SAF** | Pearson Correlation | .602\*\* | | .477\*\* | | | | .615\*\* | | | .057 | | | -.083 | | | | -.348\*\* | | | .541\*\* | | | .474\*\* | | | | .516\*\* | | | | .575\*\* | | | | -.475\*\* | | | .421\*\* | | | -.327\*\* | | | | |
|  |  | |  | | | |  | | |  | | |  | | | |  | | |  | | |  | | | |  | | | |  | | | |  | | |  | | |  | | | | |
|  |  | |  | | | |  | | |  | | |  | | | |  | | |  | | |  | | | |  | | | |  | | | |  | | |  | | |  | | | | |
| **SC** | Pearson Correlation | .243\*\* | | .203\*\* | | | | .254\*\* | | | .045 | | | .006 | | | | -.092\* | | | .246\*\* | | | .265\*\* | | | | .291\*\* | | | | .301\*\* | | | | -.276\*\* | | | .250\*\* | | | -.188\*\* | | | | |
|  |  | |  | | | |  | | |  | | |  | | | |  | | |  | | |  | | | |  | | | |  | | | |  | | |  | | |  | | | | |
|  |  | |  | | | |  | | |  | | |  | | | |  | | |  | | |  | | | |  | | | |  | | | |  | | |  | | |  | | | | |
| **ISWR** | Pearson Correlation | .282\*\* | | .194\*\* | | | | .274\*\* | | | .000 | | | -.083 | | | | -.089\* | | | .147\*\* | | | .152\*\* | | | | .138\*\* | | | | .164\*\* | | | | -.195\*\* | | | .129\*\* | | | -.167\*\* | | | | |
|  |  | | | |  | |  | |  | | |  | | | |  | | | | | |  |  | | |  | | | |  | | | |  | | |  | | | | |  | |  | | |
| Table 2. Bivariate Pearson Correlations.\*\*. Correlation is significant at the 0.01 level (2-tailed). Abbreviations. OOPS - Outcomes of poor sleep; PSAD - Poor sleep and distress; SAF - Sleepiness and fatigue; SC - Sleep compensation; ISWC - Impaired Sleep-wake routine; PSA - Pree-sleep arousal total score; PSAC - Pree-sleep arousal cognitive symptoms; PSAS - Pree-sleep arousal somatic symptoms; SLCC - Sleep locus of control by chance; SLCI - Sleep locus of control of internal factors; SWLS - Satisfaction with life; STR - Stress; A - Anxiety; D - Depression; DST - General distress; BADS - Behavioral activation for depression; AV - Avoidance behaviors; ACT - Activation behaviors. | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|  | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

As shown in Table 2., Outcomes of poor sleep score along with its factors formed significant correlations with almost all of the conceptually and theoretically relevant constructs. Total score of Outcomes of poor sleep was found to be positively related to the Pree-sleep arousal experiences (r=.67; p <0.001) cognitive (r=.59; p <0.001) and somatic symptoms (r=.72; p <0.001), Sleep locus of control by chance (r=.16; p <0.001), stress (r=.58; p <0.001), anxiety (r=.56; p <0.001), depression (r=.57; p <0.001), distress (r=.64; p <0.001) and avoidance behaviors (r=.48; p <0.001) and negatively related to the satisfaction with life (r=-.30; p <0.001), behavioral activation for depression (r=-.50; p <0.001) and activation behaviors (r=-.32; p <0.001). Additionally, Poor sleep and distress formed a significant relation to the Pree-sleep arousal experiences (r=.63; p <0.001) cognitive (r=.57; p <0.001) and somatic symptoms (r=.69; p <0.001), Sleep locus of control by chance (r=.21; p <0.001), stress (r=.53; p <0.001), anxiety (r=.51; p <0.001), depression (r=.51; p <0.001), distress (r=.58; p <0.001) and avoidance behaviors (r=.43; p <0.001) and negatively related to the satisfaction with life (r=-.26; p <0.001), behavioral activation for depression (r=-.46; p <0.001) and activation behaviors (r=-.29; p <0.001). Sleepiness and fatigue was found to be positively related to the Pree-sleep arousal experiences (r=.60; p <0.001) cognitive (r=.47; p <0.001) and somatic symptoms (r=.61; p <0.001), stress (r=.54; p <0.001), anxiety (r=.47; p <0.001), depression (r=.51; p <0.001), distress (r=.57; p <0.001) and avoidance behaviors (r=.42; p <0.001) and negatively related to the satisfaction with life (r=-.34; p <0.001), behavioral activation for depression (r=-.47; p <0.001) and activation behaviors (r=-.32; p <0.001). Sleep compensation formed a significant weak relations with Pree-sleep arousal experiences (r=.24; p <0.001) cognitive (r=.20; p <0.001) and somatic symptoms (r=.25; p <0.001), stress (r=.24; p <0.001), anxiety (r=.29; p <0.001), depression (r=.26; p <0.001), distress (r=.30; p <0.001) and avoidance behaviors (r=.25; p <0.001) and was negatively related on the very weak level with the satisfaction with life (r=-.09; p <0.05), behavioral activation for depression (r=-.27; p <0.001) and activation behaviors (r=-.18; p <0.001). Impaired sleep-wake routine formed a significantly very weak and weak relations with Pree-sleep arousal experiences (r=.28; p <0.001) cognitive (r=.19; p <0.001) and somatic symptoms (r=.27; p <0.001), stress (r=.14; p <0.001), anxiety (r=.15; p <0.001), depression (r=.13; p <0.001), distress (r=.16; p <0.001) and avoidance behaviors (r=.12; p <0.001) and was negatively related on the very weak level with the satisfaction with life (r=-.09; p <0.05), behavioral activation for depression (r=-.19; p <0.001) and activation behaviors (r=-.16; p <0.001).

**Discussion**

The goal of this research was to devise a reliable scale for research and therapeutic purposes. Three main premises guided its development: the need for time-sensitive, reliable scales (Meng et al., 2023), items based on sleep science and psychotherapeutic literature, and adjustments through exploratory and parallel analyses. The Outcomes of Poor Sleep Scale was refined to 32 items, identifying four factors: Poor sleep and distress, Sleepiness and fatigue, Sleep compensation, and Impaired sleep-wake routine. These align with existing models and prior studies (Bromberg et al., 2020; Meng et al., 2023; Wilkinson & Shapiro, 2013). Poor Sleep and Distress reflects the emotional impact of poor sleep, with prolonged dysregulation leading to poor outcomes (Boivin et al., 2007; Kalmbach et al., 2020). Sleepiness indicates the need for sleep, while fatigue is a lack of physical energy. These states are correlated and related to stress (Axelsson et al., 2020; Lang et al., 2023). Sleep Compensation, a response to sleep debt, involves increasing sleep duration or frequency (Åkerstedt et al., 2019) and is linked to pre-sleep arousal and distress. Impaired Sleep-Wake Routine involves disrupted or variable sleep schedules, negatively correlating with life satisfaction and behavioral activation (Ong et al., 2020; Ruivo Marques et al., 2018). The scale demonstrated high reliability (α=.93) and significant correlations with pre-sleep arousal, cognitive and somatic symptoms, and measures of stress, anxiety, and depression. These findings suggest potential targets for therapeutic or medical intervention. Poor sleep outcomes are often noticeable after just one night (McEwen & Karatsoreos, 2022; Pflug & Tolle, 1971) and can affect cognitive performance for up to two weeks (Dinges et al., 1997; Durmer & Dinges, 2005; Lee, 2022; Scott et al., 2006; Smith et al., 2021). Additionally, sleep problems impact therapeutic outcomes and life satisfaction (Kleim et al., 2014; Scott et al., 2021; Yager, 2021). The scale also showed correlations with beliefs about sleep (Sleep locus of control - chance), stress, anxiety, depression, distress, and avoidance behaviors, aligning with prior validation research (Ali et al., 2020; Espie et al., 2014; Fernandez-Mendoza et al., 2015; Gómez-Benito et al., 2011; Jansson-Fröjmark & Boersma, 2012; Kato, 2014; Tang & Harvey, 2004; Tibubos et al., 2020; Wolińska et al., 2022; Yarlas et al., 2021). These correlations highlight the dysregulation of the arousal system, suggesting it as a target for intervention, although further research is needed. The relationship between poor sleep and distress appears bidirectional and is associated with poor coping skills and avoidance behaviors (Fernandez-Mendoza et al., 2015; Kozusznik et al., 2021). This aligns with the premise that homeostatic load (process S) is influenced by prolonged wakefulness and activity. Sleepiness, a natural signal for sleep, promotes preparatory behaviors and blocks other needs (Axelsson et al., 2020). Fatigue, on the other hand, is a lack of energy and motivation, often related to stress (Long et al., 2022; Pigeon et al., 2003). Previous research shows a significant correlation between sleepiness and fatigue (Hossain et al., 2005; Braley et al., 2012; Sparasci et al., 2022). Sleepiness and fatigue were significantly correlated with pre-sleep arousal, cognitive and somatic symptoms, stress, anxiety, depression, distress, and life satisfaction. Arousal states disrupting sleep opportunities can lead to elevated sleepiness and fatigue, a concept needing further confirmation. Sleep compensation, an appetitive response to sleep debt, was found to be positively related to pre-sleep arousal, suggesting that disrupted sleep leads to rebound episodes (Åkerstedt et al., 2019; Liu et al., 2012; Wing et al., 2009). It showed a weak correlation with distress, indicating it might be a coping response to elevated distress (Babson et al., 2010). Impaired sleep-wake routine, a pattern of disrupted sleep schedules, negatively correlated with life satisfaction, behavioral activation for depression, and activation behaviors. Individuals with disrupted sleep may face challenges in maintaining social, professional, and physical activities, leading to stress, anxiety, and depressiveness (Ong et al., 2020; Ruivo Marques et al., 2018; Štefan et al., 2018). These results are based on the general population, and further research is needed to generalize findings to clinical samples. Nevertheless, the scale is promising for detecting less structured disrupted sleep experiences such as insufficient, non-restorative, and sleepless nights during the week.

**Limitations and future directions**

Future research should focus on expanding and assessing additional items for inclusion in extended versions of this instrument. The current results should not be generalized to clinical populations due to the sample nature. Therefore, validating this scale with individuals suffering from depression, insomnia, PTSD, anxiety, and bipolar disorder would be beneficial. Additionally, exploring the relationship between OOPS scores and physical and medical symptoms could determine its utility in medical practice.

**Conclusion**

The Outcomes of Poor Sleep Scale first edition (OOPS-s (I)) has shown to be a reliable and promising tool for measuring different types of acute sleep disturbances. The results align with the Two-process model of sleep regulation and the Cognitive-behavioral paradigm. This study supports its potential use in future research and therapeutic settings, particularly for individuals unsatisfied with their sleep quality. With further validation and data from diverse populations, this instrument could effectively assess, monitor, and address sleep difficulties in therapeutic and counseling contexts. It could also help practitioners screen for detrimental changes in sleep during therapy sessions. Sleep disturbances often signal the onset of mental disorders, and improvements can indicate remission (Blanken et al., 2020). Given the prevalence of sleep disturbances, it is crucial to normalize sleep difficulties in public discourse and therapy while pathologizing sleep can lead to stress, fatigue, suicidality, and self-stigmatization (Lichstein, 2017). Sleep difficulties are a common complaint (Yi et al., 2009), and proper communication between therapists and clients can prevent further complications in everyday functioning and psychotherapeutic practice.

**Conflicts of Interests**

The authors declare that there is no conflict of interests regarding the publication of this paper.

**References**

Ahsberg, E., Gamberale, F., & Gustafsson, K. (2000). Perceived fatigue after mental work: An experimental evaluation of a fatigue inventory. *Ergonomics*, 43(2), 252-268. https://doi.org/10.1080/001401300184594

Akanni, O., Olashore, A., & Koleoso, O. (2022). Validation of the Sleep Quality Questionnaire among senior students in Benin City, Nigeria. *South African Journal of Psychiatry*, 28, 1875. https://doi.org/10.4102/sajpsychiatry.v28i0.1875

Åkerstedt, T., Ghilotti, F., Grotta, A., Zhao, H., Adami, H. O., Trolle-Lagerros, Y., & Bellocco, R. (2019). Sleep duration and mortality - Does weekend sleep matter? *Journal of Sleep Research*, 28(1), e12712. https://doi.org/10.1111/jsr.12712

Ali, R. M., Zolezzi, M., & Awaisu, A. (2020). A Systematic Review of Instruments for the Assessment of Insomnia in Adults. Nature and science of sleep, 12, 377–409. <https://doi.org/10.2147/NSS.S250918>.

Arand, D.L., & Bonnet, M. H (2023). Risk factors, comorbidities, and consequences of insomnia in adults. *UpToDate*. Retrieved March 9, 2023, from https://www.uptodate.com/contents/risk-factors-comorbidities-and-consequences-of-insomnia-in-adults

Axelsson, J., Ingre, M., Kecklund, G., Lekander, M., Wright, K. P., & Sundelin, T. (2020). Sleepiness as motivation: a potential mechanism for how sleep deprivation affects behavior. *Sleep*, *43*(6), zsz291. https://doi.org/10.1093/sleep/zsz291

Babson, K. A., Trainor, C. D., Feldner, M. T., & Blumenthal, H. (2010). A test of the effects of acute sleep deprivation on general and specific self-reported anxiety and depressive symptoms: An experimental extension. *Journal of Behavioral Therapy and Experimental Psychiatry*, 41(3), 297-303. https://doi.org/10.1016/j.jbtep.2010.02.008

Banks, S., & Dinges, D. F. (2007). Behavioral and physiological consequences of sleep restriction. *Journal of Clinical Sleep Medicine,* 3(5), 519-528.

Barlow, D. H. (2021). *Clinical Handbook of Psychological Disorders, Sixth Edition: A Step-by-Step Treatment Manual.* Guilford Publications.

Barnes, C. M., & Drake, C. L. (2015). Prioritizing sleep health: Public health policy recommendations. *Perspectives on Psychological Science*, 10(6), 733-737. https://doi.org/10.1177/1745691615598509

Blampied, N. M., & Bootzin, R. R. (2013). Sleep: A behavioral account. In G. J. Madden et al. (Eds.), APA handbook of behavior analysis, Vol. 2: Translating principles into practice (pp. 425-453). American Psychological Association. https://doi.org/10.1037/13938-017

Blanken, T. F., Borsboom, D., Penninx, B. W., & Van Someren, E. J. (2020). Network outcome analysis identifies difficulty initiating sleep as a primary target for prevention of depression: A 6-year prospective study. *Sleep*, 43(5), zsz288.

Boivin, D. B., Tremblay, G. M., & James, F. O. (2007). Working on atypical schedules. *Sleep medicine*, *8*(6), 578–589. https://doi.org/10.1016/j.sleep.2007.03.015

Borbély, A. A. (1982). A Two Process Model of Sleep Regulation. *Human Neurobiology*, 1(3), 195-204.

Borbély, A. A., Daan, S., Wirz-Justice, A., & Deboer, T. (2016). The two-process model of sleep regulation: A reappraisal. *Journal of Sleep Research*, 25(2), 131-143. <https://doi.org/10.1111/jsr.12371>

Bonnet, M., & Arand, D. (2003). Clinical effects of sleep fragmentation versus sleep deprivation. *Sleep medicine reviews*, 7, 297-310. 10.1053/smrv.2001.0245.

Braley, T. J., Chervin, R. D., & Segal, B. M. (2012). Fatigue, tiredness, lack of energy, and sleepiness in multiple sclerosis patients referred for clinical polysomnography. *Multiple Sclerosis International*, 2012, 673936. https://doi.org/10.1155/2012/673936

Bromberg, M. H., de la Vega, R., Law, E. F., Zhou, C., & Palermo, T. M. (2020). Development and Validation of the Adolescent Insomnia Questionnaire. *Journal of pediatric psychology*, *45*(1), 61–71. https://doi.org/10.1093/jpepsy/jsz073

Carskadon, M. A., Dement, W. C., Mitler, M. M., Roth, T., Westbrook, P. R., & Keenan, S. (1986). Guidelines for the multiple sleep latency test (MSLT): a standard measure of sleepiness. *Sleep*, *9*(4), 519–524. https://doi.org/10.1093/sleep/9.4.519

Carskadon, M., & Dement, W. (1989). Normal human sleep: An overview. In M. H. Kryger (Ed.), *Principles and practice of sleep medicine* (pp. 3-13). W.B. Saunders.

Chun, S., Lee, Y., Kim, B., & Heo, J. (2012). The Contribution of Leisure Participation and Leisure Satisfaction to Stress-Related Growth. *Leisure Sciences*, 34(5), 436-449. https://doi.org/10.1080/01490400.2012.714704

Costello, A. B., & Osborne, J. (2005). Best practices in exploratory factor analysis: Four recommendations for getting the most from your analysis. *Practical Assessment, Research & Evaluation*, 10, 1-9.

Cirelli, C. (February 2024). Insufficient sleep: Definition, epidemiology, and adverse outcomes. In R. Benca & A. Eichler (Ed.). UpToDate.

Diener, E., Emmons, R. A., Larsen, R. J., & Griffin, S. (1985). The Satisfaction With Life Scale. *Journal of personality assessment*, *49*(1), 71–75. https://doi.org/10.1207/s15327752jpa4901\_13

Dinges, D. F., Pack, F., Williams, K., Gillen, K. A., Powell, J. W., Ott, G. E., Aptowicz, C., & Pack, A. I. (1997). Cumulative sleepiness, mood disturbance, and psychomotor vigilance performance decrements during a week of sleep restricted to 4-5 hours per night. *Sleep*, 20(4), 267-277.

Durmer, J. S., & Dinges, D. F. (2005). Neurocognitive Consequences of Sleep Deprivation. *Seminars in Neurology*, 25(1), 117-129. https://doi.org/10.1055/s-2005-867080

Edinger, J. D., & Carney, C. (2014). *Overcoming Insomnia: Therapist Guide*. Oxford University Press.

Eppelmann, L., Parzer, P., Lenzen, C., Bürger, A., Haffner, J., Resch, F., & Kaess, M. (2016). Stress, coping and emotional and behavioral problems among German high school students. *Mental Health & Prevention*, 4(2), 81-87. https://doi.org/10.1016/j.mhp.2016.03.002

Espie, C. A., Kyle, S. D., Hames, P., et al. (2014). The Sleep Condition Indicator: A clinical screening tool to evaluate insomnia disorder. *BMJ Open*, 4, e004183. https://doi.org/10.1136/bmjopen-2013-004183

Evans, J. D. (1996). *Straightforward Statistics for the Behavioral Sciences*. Brooks/Cole.

Fernandez-Mendoza, J., Shea, S., Vgontzas, A. N., Calhoun, S. L., Liao, D., & Bixler, E. O. (2015). Insomnia and incident depression: Role of objective sleep duration and natural history. *Journal of Sleep Research*, 24(4), 390-398. https://doi.org/10.1111/jsr.12285

Field, A. (2020). *Discovering Statistics Using IBM SPSS Statistics*. Sage.

Gómez-Benito, J., Guilera, G., & Rojo, J. E. (2011). A Spanish version of the Athens Insomnia Scale. *Quality of Life Research*, 20(6), 931-937.<https://doi.org/10.1007/s11136-010-9827-x>

Grèzes, J., Wicker, B., Berthoz, S., & de Gelder, B. (2021). Impact of total sleep deprivation and related mood changes on approach-avoidance decisions to threat-related facial displays. Sleep, 44(12), zsab186. https://doi.org/10.1093/sleep/zsab186

Herawati, K., & Gayatri, D. (2019). The correlation between sleep quality and levels of stress among students in Universitas Indonesia. *Enfermería Clínica*, 29(2), 357–361.<https://doi.org/10.1016/j.enfcli.2019.04.044>

Hossain, J. L., Ahmad, P., Reinish, L. W., Kayumov, L., Hossain, N. K., & Shapiro, C. M. (2005). Subjective fatigue and subjective sleepiness: two independent consequences of sleep disorders?. *Journal of sleep research*, *14*(3), 245-253. https://doi.org/10.1111/j.1365-2869.2005.00466.x

Hughes, Jaime & Song, Yeonsu & Fung, Constance & Dzierzewski, Joseph & Mitchell, Michael & Jouldjian, Stella & Josephson, Karen & Alessi, Cathy. (2017). Measuring Sleep in Vulnerable Older Adults: A Comparison of Subjective and Objective Sleep Measures. Clinical Gerontologist. 41. 10.1080/07317115.2017.1408734.

Hull, C. L. (1943). *Principles of behavior: An introduction to behavior theory*. Appleton-Century.

Ibáñez, V., Silva, J., & Cauli, O. (2018). A survey on sleep questionnaires and diaries. *Sleep medicine*, *42*, 90–96. https://doi.org/10.1016/j.sleep.2017.08.026

Igbokwe, D. (2021). Sleep Locus of Control Differences in Undergraduates Sleep Beliefs and Quality. *Clinical Psychiatry*, 7(S6), e001.

Jansson-Fröjmark, M., & Boersma, K. (2012). Bidirectionality between pain and insomnia symptoms: A prospective study. *British Journal of Health Psychology*, 17(2), 420-431. https://doi.org/10.1111/j.2044-8287.2011.02045.x

Jansson-Fröjmark, M., & Norell-Clarke, A. (2012). Psychometric properties of the Pre-Sleep Arousal Scale in a large community sample. *Journal of Psychosomatic Research*, 72(2), 103-110.

Jensen, E. S., Ladegaard, N., Mellentin, A. I., Ebert, D. D., Titzler, I., Araya, R., Cerga Pashoja, A., Hazo, J. B., Holtzmann, J., Cieslak, R., Smoktunowicz, E., Baños, R., Herrero, R., García-Palacios, A., Botella, C., Berger, T., Krieger, T., Holmberg, T. T., Topooco, N., Andersson, G., … Mathiasen, K. (2022). Effect of Sleep Disturbance Symptoms on Treatment Outcome in Blended Cognitive Behavioral Therapy for Depression (E-COMPARED Study): Secondary Analysis. *Journal of medical Internet research*, *24*(3), e30231. https://doi.org/10.2196/30231

Jovanović, V. (2016). The validity of the Satisfaction with Life Scale in adolescents and a comparison with single-item life satisfaction measures: A preliminary study. *Quality of Life Research*, 25(12), 3173-3180.

Jovanović, V., Gavrilov-Jerković, V., Žuljević, D., & Brdarić, D. (2014). Psihometrijska evaluacija Skale depresivnosti, anksioznosti i stresa-21 (DASS-21) na uzorku studenata u Srbiji. *Psihologija*, *47*(1).

Kalmbach, D. A., Anderson, J. R., & Drake, C. L. (2020). Nocturnal cognitive arousal is associated with objective sleep disturbance and indicators of physiologic hyperarousal in good sleepers and individuals with insomnia disorder. *Sleep Medicine*, 71, 151-160. https://doi.org/10.1016/j.sleep.2019.11.1184

Kanter, J. W., Mulick, P. S., Busch, A. M., Berlin, K. S., & Martell, C. R. (2012). Behavioral Activation for Depression Scale (BADS)(long and short form). Measurement instrument database for the social science.

Kato, T. (2014). Development of the Sleep Quality Questionnaire in healthy adults. *Journal of Health Psychology*, 19(8), 977-986. https://doi.org/10.1177/1359105313482168

Kim, C.-W., Lee, H.-M., Lee, H.-S., Hong, S.-B., & Kim, J.-H. (2018). Changes in sleep duration and subsequent risk of hypertension in healthy adults. *Sleep*, 41(11), zsy159. https://doi.org/10.1093/sleep/zsy159

Kim, E.-J., & Dimsdale, J. E. (2007). The effect of psychosocial stress on sleep: A review of polysomnographic evidence. *Behavioral Sleep Medicine*, 5(4), 256-278. https://doi.org/10.1080/15402000701557383

Kleim, B., Ehring, T., & Ehlers, A. (2014). Sleep enhances exposure therapy. *Psychological Medicine*, 44(7), 1511-1519. https://doi.org/10.1017/S0033291713001748

Knutsson, A. (2003). Health Disorders of Shift Workers. *Occupational Medicine*, 53(2), 103-108. https://doi.org/10.1093/occmed/kqg048

Kochanek, K. D., Murphy, S. L., Xu, J., & Arias, E. (2014). Mortality in the United States, 2013. NCHS Data Brief, 178, 1-8.

Kohyama, J. (2021). Which is more important for health: Sleep quantity or sleep quality? *Children*, 8(7), 542. https://doi.org/10.3390/children8070542

Kozusznik, M. W., Puig-Perez, S., Kożusznik, B., & Pulopulos, M. M. (2021). The Relationship Between Coping Strategies and Sleep Problems: The Role of Depressive Symptoms. *Annals of Behavioral Medicine*, 55(3), 253-265. https://doi.org/10.1093/abm/kaaa048

Laaban, J. P. (2014). Insomnia and accidents: Cross-sectional study (EQUINOX) on sleep-related home, work, and car accidents in 5293 subjects with insomnia from 10 countries. *Journal of Sleep Research*, 23(2), 143-152. https://doi.org/10.1111/jsr.12104

Lang, X., et al. (2023). Corrigendum: Relations among Perceived Stress, Fatigue, and Sleepiness, and Their Effects on the Ambulatory Arterial Stiffness Index in Medical Staff: A Cross-Sectional Study. *Frontiers in Psychology*, 13. https://doi.org/10.3389/fpsyg.2022.1117115

Lee, S. (2022). Naturally occurring consecutive sleep loss and day-to-day trajectories of affective and physical well-being. *Annals of Behavioral Medicine*, 56(4), 393-404. https://doi.org/10.1093/abm/kaab055

Léger, D., Bayon, V., Ohayon, M. M., Philip, P., Ement, P., Metlaine, A., Chennaoui, M., & Faraut, B. (2014). Insomnia and accidents: cross-sectional study (EQUINOX) on sleep-related home, work and car accidents in 5293 subjects with insomnia from 10 countries. *Journal of sleep research*, *23*(2), 143–152. https://doi.org/10.1111/jsr.12104

Lichstein, K. L. (2017). Insomnia identity. *Behavior Research and Therapy*, 97, 230-241. https://doi.org/10.1016/j.brat.2017.08.005

Liu, J., Zhang, A., & Li, L. (2012). Sleep duration and overweight/obesity in children: Review and implications for pediatric nursing. *Journal of Specialist Pediatric Nursing*, 17(3), 193-204.<https://doi.org/10.1111/j.1744-6155.2012.00332.x>

Lockley, S. W., & Foster, R. G. (2012). *Sleep: A very short introduction*. Oxford University Press.

Long, H., Scott, H., & Lack, L. (2022). Sleepy, tired, drowsy, and fatigue have different meanings for a university student sample. *Journal of Clinical Sleep Medicine*, 18(5), 1235-1241. https://doi.org/10.5664/jcsm.9780

Lovibond, P. F., & Lovibond, S. H. (1995). The structure of negative emotional states: Comparison of the Depression Anxiety Stress Scales (DASS) with the Beck Depression and Anxiety Inventories. *Behaviour Research and Therapy*, 33(3), 335-343.

Ma, N., Dinges, D. F., Basner, M., & Rao, H. (2015). How acute total sleep loss affects the attending brain: A meta-analysis of neuroimaging studies. *Sleep*, 38(2), 233-240. https://doi.org/10.5665/sleep.4404

Manos, R. C., Kanter, J. W., & Luo, W. (2011). The behavioral activation for depression scale-short form: development and validation. *Behavior therapy*, *42*(4), 726–739. https://doi.org/10.1016/j.beth.2011.04.004

McEwen, B. S., & Karatsoreos, I. N. (2022). Sleep Deprivation and Circadian Disruption Stress, Allostasis, and Allostatic Load. *Sleep Medicine Clinics*, 17(2), 253-262.

McNamara, P., Barton, R. A., & Nunn, C. L. (Eds.). (2010). *Evolution of sleep: Phylogenetic and functional perspectives.* Cambridge University Press.

Meadows, G. (2015). *The Sleep Book: How to Sleep Well Every Night.* Orion Publishing Group.

Medic, G., Wille, M., & Hemels, M. E. H. (2017). Short- and long-term health consequences of sleep disruption. *Nature and Science of Sleep*, 9, 151-161. https://doi.org/10.2147/NSS.S134864

Meng, R., Kato, T., Mastrotheodoros, S., Dong, L., Fong, D. Y. T., Wang, F., ... & Gozal, D. (2023). Adaptation and validation of the Chinese version of the Sleep Quality Questionnaire. *Quality of Life Research*, *32*(2), 569-582. https://doi.org/10.1007/s11136-022-03241-9

Mihić, L., Sokić, J., Samac, N., & Ignjatović, I. (2014). Srpska adaptacija i validacija upitnika netolerancije na neizvesnost. *Primenjena psihologija*, *7*.

Miladinović, P., & Mitić, A.. (2022). Preliminary psychometric investigation of Serbian mindful attention and awareness scale (MAAS) and potential role of mindful attention and awareness in behavioral regulation among students. *Engrami*. 44. 4-21. 10.5937/engrami44-36516.

Minkel, J. D., Banks, S., Htaik, O., Moreta, M. C., Jones, C. W., McGlinchey, E. L., Simpson, N. S., & Dinges, D. F. (2012). Sleep deprivation and stressors: Evidence for elevated negative affect in response to mild stressors when sleep deprived. *Emotion*, 12(5), 1015-1020. https://doi.org/10.1037/a0026871

Nelson, K. L., Davis, J. E., & Corbett, C. F. (2021). Sleep quality: An evolutionary concept analysis. *Nursing Forum*, *57*(1). https://doi.org/10.1111/nuf.12659

Nicassio, P. M., Mendlowitz, D. R., Fussell, J. J., & Petras, L. (1985). The phenomenology of the pre-sleep state: the development of the pre-sleep arousal scale. *Behaviour research and therapy*, *23*(3), 263-271.

Nimrod, G., Kleiber, D. A., & Berdychevsky, L. (2012). Leisure in coping with depression. *Journal of Leisure Research*, *44*(4), 419-449.

Ong, W. J., Tan, X. W., Shahwan, S., et al. (2020). Association between sleep quality and domains of quality of life amongst patients with first episode psychosis. *Health Quality of Life Outcomes*, 18, 114. https://doi.org/10.1186/s12955-020-01367-3

Opanković, A., Latas, M., Ristić, I., Jerotic, S., Bukumirić, Z., Lalović, N., & Milovanović, S. (2021). Predictors of depression, anxiety and stress during the first wave of the covid-19 pandemic: The results of an online survey in Serbia. *Engrami*, *43*(2).

Patil, V. H., Singh, S. N., Mishra, S., & Donavan, D. T. (2008). Efficient theory development and factor retention criteria: Abandon the ‘eigenvalue greater than one’criterion. *Journal of Business Research*, *61*(2), 162-170.

Peng, Z., Dai, C., Ba, Y., Zhang, L., Shao, Y., & Tian, J. (2020). Effect of Sleep Deprivation on the Working Memory-Related N2-P3 Components of the Event-Related Potential Waveform. *Frontiers in neuroscience*, *14*, 469. https://doi.org/10.3389/fnins.2020.00469

Perlis, M. L., Aloia, M., & Kuhn, B. (Eds.). (2010). *Behavioral treatments for sleep disorders: A comprehensive primer of behavioral sleep medicine interventions*. Academic Press.

Pflug, B., & Tolle, R. (1971). Therapy of Endogenous Depressions Using Sleep Deprivation: Practical and Theoretical Consequences. *Nervenarzt*, 42(3), 117-124.

Pigeon, W. R., Sateia, M. J., & Ferguson, R. J. (2003). Distinguishing between excessive daytime sleepiness and fatigue: Toward improved detection and treatment. *Journal of Psychosomatic Research*, 54(1), 61-69. https://doi.org/10.1016/s0022-3999(02)00542-1

‌Roth T, Roehrs T (2003). Insomnia: epidemiology, characteristics, and consequences. *Clinical Cornerstone*. 5 (3): 5–15. [doi](https://en.wikipedia.org/wiki/Doi_(identifier)):[10.1016/S1098-3597(03)90031-7](https://doi.org/10.1016%2FS1098-3597%2803%2990031-7). [PMID](https://en.wikipedia.org/wiki/PMID_(identifier)) [14626537](https://pubmed.ncbi.nlm.nih.gov/14626537)

Ruivo Marques, D., Allen Gomes, A., Nicassio, P. M., & Azevedo, M. H. P. (2018). Pre-Sleep Arousal Scale (PSAS): psychometric study of a European Portuguese version. *Sleep medicine*, *43*, 60–65. https://doi.org/10.1016/j.sleep.2017.10.014

Schiffrin, H. H., & Nelson, S. K. (2010). Stressed and Happy? Investigating the Relationship between Happiness and Perceived Stress. *Journal of Happiness Studies*, 11(1), 33-39. https://doi.org/10.1007/s10902-008-9104-7

Scott, A. J., Webb, T. L., Martyn-St James, M., Rowse, G., & Weich, S. (2021). Improving sleep quality leads to better mental health: A meta-analysis of randomised controlled trials. *Sleep medicine reviews*, *60*, 101556.<https://doi.org/10.1016/j.smrv.2021.101556>

Scott, J. P. R., McNaughton, L. R., & Polman, R. C. J. (2006). Effects of sleep deprivation and exercise on cognitive, motor performance, and mood. *Physiology & Behavior*, 87(2), 396-408. https://doi.org/10.1016/j.physbeh.2005.11.009

Serrano-Checa, R., Hita-Contreras, F., Jiménez-García, J. D., Achalandabaso-Ochoa, A., Aibar-Almazán, A., & Martínez-Amat, A. (2020). Sleep Quality, Anxiety, and Depression Are Associated with Fall Risk Factors in Older Women. *International journal of environmental research and public health*, *17*(11), 4043. https://doi.org/10.3390/ijerph17114043

Shahid, A., Wilkinson, K., Marcu, S., & Shapiro, C. M. (2011). Sleep locus of control scale (SLOC). In *STOP, THAT and One Hundred Other Sleep Scales* (pp. 335-339). New York, NY: Springer New York.

Sharath, S., & Loganathan, K. (2022). A Quantitative Analysis Between Sleep and Psychological Behaviour of Indian Construction Workers. *Journal of Turkish Sleep Medicine*, *9*(3), 221–231.<https://doi.org/10.4274/jtsm.galenos.2022.64426>

Skinner, B. F. (1953). *Science and human behavior*. Free Press.

Šljivo, A., Karahodžić, E., Mehmedbegović, A., & Ohranović, N. (2022). Sleep quality and patterns of young West Balkan adults during the third wave of the COVID-19 pandemic: A cross-sectional study. *BMJ Open*, 12(2), e060381. https://doi.org/10.1136/bmjopen-2021-060381

Smith, M. G., Wusk, G. C., Nasrini, J., Baskin, P., Dinges, D. F., Roma, P. G., & Basner, M. (2021). Effects of six weeks of chronic sleep restriction with weekend recovery on cognitive performance and wellbeing in high-performing adults. *Sleep*, *44*(8), zsab051. https://doi.org/10.1093/sleep/zsab051

Sparasci, D., Gobbi, C., Castelnovo, A., et al. (2022). Fatigue, sleepiness and depression in multiple sclerosis: Defining the overlaps for a better phenotyping. *Journal of Neurology*, 269, 4961-4971. https://doi.org/10.1007/s00415-022-11143-6

Spoormaker, V. I., van den Bout, J., & Meijer, E. J. (2005). Initial validation of the SLEEP-50 questionnaire. *Behavioral Sleep Medicine*, 3(4), 227-246.

Stada. (2022). Stada health report 2022. Retrieved from http://www.stada.com/2022healthreport

Štefan, L., Sporiš, G., Krističević, T., et al. (2018). Associations between sleep quality and its domains and insufficient physical activity in a large sample of Croatian young adults: A cross-sectional study. *BMJ Open*, 8, e021902. https://doi.org/10.1136/bmjopen-2018-021902

Stores, G. (2009). *Insomnia and other adult sleep problems.* Oxford University Press.

Tang, N. K. Y., & Harvey, A. G. (2004). Effects of cognitive arousal and physiological arousal on sleep perception. *Sleep*, 27(1), 69-78. https://doi.org/10.1093/sleep/27.1.69

Tibubos, A. N., Zenger, M., Schmalbach, B., Beutel, M. E., & Brähler, E. (2020). Measurement invariance, validation and normative data of the Jenkins Sleep Scale-4 (JSS-4) in the German general population across the lifespan. *Journal of Psychosomatic Research*, 130, 109933. https://doi.org/10.1016/j.jpsychores.2020.109933

Van Dongen, H. P. A., Maislin, G., Mullington, J. M., & Dinges, D. F. (2003). The cumulative cost of additional wakefulness: Dose-response effects on neurobehavioral functions and sleep physiology from chronic sleep restriction and total sleep deprivation. *Sleep*, 26(2), 117-126.

Vieira, P., et al. (2023). Psychometric Properties of the Sleep Locus of Control (SLOC) Scale in a Portuguese Sample. *Journal of Rational-Emotive & Cognitive-Behavior Therapy*, 41, 193-208.

Vincent, N., Sande, G., Read, C., & Giannuzzi, T. (2004). Sleep locus of control: report on a new scale. *Behavioral sleep medicine*, *2*(2), 79–93. https://doi.org/10.1207/s15402010bsm0202\_1

Višnjić, A., Veličković, V., Sokolović, D., Stanojević, M., & Mitić, M. (2020). Relationships between quality of sleep and insomnia with depression and anxiety symptoms in medical university students in Serbia. *Acta Medica Medianae*, 59(1), 44-50. https://doi.org/10.5633/amm.2020.0106

Wagener, A., Van der Linden, M., & Blairy, S. (2015). Psychometric properties of the French translation of the Behavioral Activation for Depression Scale–Short Form (BADS-SF) in non-clinical adults. *Comprehensive Psychiatry*, 56, 252–257. https://doi.org/10.1016/j.comppsych.2014.10.008

Walker, M. (2017). *Why We Sleep.* Scribner.

Wilkinson, K., & Shapiro, C. (2013). Development and Validation of the Nonrestorative Sleep Scale (NRSS). *Journal of Clinical Sleep Medicine*, 9(9), 929-937.<https://doi.org/10.5664/jcsm.2996>

Wing, Y. K., Li, S. X., Li, A. M., Zhang, J., & Kong, A. P. (2009). The effect of weekend and holiday sleep compensation on childhood overweight and obesity. *Pediatrics*, 124(5), e994-e1000. https://doi.org/10.1542/peds.2008-3602

Winter, W. C. (2018). *The Sleep Solution: Why Your Sleep Is Broken and How to Fix It.* Berkley.

Wolińska, W., Szych, Z., & Dziankowska-Zaborszczyk, E. (2022). Sleep problems and related factors in rural and urban populations in Western Pomerania, Poland. *Annals of Agricultural and Environmental Medicine*, 29(3), 443-452. https://doi.org/10.26444/aaem/152740

Woolbert, C. H. (1920). A behavioristic account of sleep. *Psychological Review*, 27(6), 420-428.<https://doi.org/10.1037/h0073384>

Yager, J. (2021). Sleepy psychotherapists: How clinicians' biological factors may affect the conduct of psychotherapy. *American Journal of Psychotherapy,* 74(1), 30-35. https://doi.org/10.1176/appi.psychotherapy.20200030

Yarlas, A., White, M. K., St Pierre, D. G., & Bjorner, J. B. (2021). The development and validation of a revised version of the Medical Outcomes Study Sleep Scale (MOS Sleep-R). *Journal of patient-reported outcomes*, *5*(1), 40. https://doi.org/10.1186/s41687-021-00311-3

Yi, H., Shin, K., Kim, J., Kim, J., Lee, J., & Shin, C. (2009). Validity and reliability of Sleep Quality Scale in subjects with obstructive sleep apnea syndrome. *Journal of psychosomatic research*, *66*(1), 85–88. https://doi.org/10.1016/j.jpsychores.2008.07.008

Zalta, A. K., Dowd, S., Rosenfield, D., Smits, J. A., Otto, M. W., Simon, N. M., Meuret, A. E., Marques, L., Hofmann, S. G., & Pollack, M. H. (2013). Sleep quality predicts treatment outcome in CBT for social anxiety disorder. *Depression and anxiety*, *30*(11), 1114–1120. https://doi.org/10.1002/da.22170

Zohar, D., Tzischinsky, O., Epstein, R., & Lavie, P. (2005). The effects of sleep loss on medical residents' emotional reactions to work events: A cognitive-energy model. *Sleep*, 28(1), 47-54.

**Supplementary material**

Supplement 1

OOPS questionnaire

| The following statements are related to your sleeping experiences. Please read the statements carefully and circle the number that best describes your experiences in the past two weeks in the following manner 0 - Not at all or never, 1 -Rarely or sometimes, 2 - Frequently or mostly and 3 - Almost always or completely. | | | | |
| --- | --- | --- | --- | --- |
| In the past two weeks… | Answers | | | |
| Not at all or never | Rarely or sometimes | Frequently or mostly | Almost always or completely |
| 1. ... I was satisfied with how much sleep I got. (R) | 0 | 1 | 2 | 3 |
| 1. ... Fatigue prevented me from doing things that are important to me. | 0 | 1 | 2 | 3 |
| 1. ... I wasn’t sure whether I was asleep or awake for most of the night. | 0 | 1 | 2 | 3 |
| 1. ... I felt fatigue in my body when I was supposed to wake up. | 0 | 1 | 2 | 3 |
| 1. ... I was irritated that I couldn’t fall asleep. | 0 | 1 | 2 | 3 |
| 1. ... I would wake up tired and restless. | 0 | 1 | 2 | 3 |
| 1. ... I spent most of the day feeling tired and sleepy. | 0 | 1 | 2 | 3 |
| 1. ... I was satisfied with the quality of my sleep. (R) | 0 | 1 | 2 | 3 |
| 1. … I felt fresh and well rested upon waking. (R) | 0 | 1 | 2 | 3 |
| 1. ... I was irritated that others have no trouble falling asleep and sleeping. | 0 | 1 | 2 | 3 |
| 1. ... I felt a strong urge to get a good night‘s sleep. | 0 | 1 | 2 | 3 |
| 1. ... I felt that my body was heavy when I was supposed to get out of bed. | 0 | 1 | 2 | 3 |
| 1. ... Upon waking up, it took me some time to feel fresh and properly waken. | 0 | 1 | 2 | 3 |
| 1. ... I went to bed at different times. | 0 | 1 | 2 | 3 |
| 1. ... I felt very tired during the day. | 0 | 1 | 2 | 3 |
| 1. ... I started to think something is wrong with me because I can’t get enough sleep. | 0 | 1 | 2 | 3 |
| 1. ... My lack of sleep worried me. | 0 | 1 | 2 | 3 |
| 1. ... I tried to relax in order to fall asleep, but without success. | 0 | 1 | 2 | 3 |
| 1. ... I woke up at different times. | 0 | 1 | 2 | 3 |
| 1. ... I felt hopeless because I can’t get enough sleep. | 0 | 1 | 2 | 3 |
| 1. ... I felt that I had lost my ability to get proper sleep. | 0 | 1 | 2 | 3 |
| 1. ... I slept longer than usual. | 0 | 1 | 2 | 3 |
| 1. ... I would sleep in to compensate my lack of sleep. | 0 | 1 | 2 | 3 |
| 1. ... I was beginning to lose hope that I would get proper sleep. | 0 | 1 | 2 | 3 |
| 1. ... I felt discomfort upon going to bed, which made it difficult to fall asleep. | 0 | 1 | 2 | 3 |
| 1. ... It took me a long time to wake up. | 0 | 1 | 2 | 3 |
| 1. ... I felt that my life was being wasted due to my lack of sleep. | 0 | 1 | 2 | 3 |
| 1. ... I usually went to bed and got up at the same periods from day to day. (R) | 0 | 1 | 2 | 3 |
| 1. ... It took me a long time to fall asleep. | 0 | 1 | 2 | 3 |
| 1. ... I felt angry because I couldn’t get enough sleep. | 0 | 1 | 2 | 3 |
| 1. ... I was worried about my health because I didn’t sleep well. | 0 | 1 | 2 | 3 |
| 1. …I would wake up in the middle of the night and have difficulty falling back asleep. | 0 | 1 | 2 | 3 |
| Total score  To calculate the total score for Outcomes of poor sleep first reverse the values of items 1,8,9, and 28 (0=3, 1=2, 2=1 and 3=0) and simply add them along with values of every 28 remaining items.  Extracted factors  Poor sleep and distress (PSAD): 3,5,10,16,17,18,20,21,24,25,27,29,30,31, and 32.  Sleepiness and fatigue (SAF): 1,2,4,6,7,8,9,11,12,13,15, and 26.  Sleep compensation (SC): 22 and 23.  Impaired sleep-wake routine (ISWR): 14,19, and 28. | | | | |

Note: permission to use this scale is granted by the author istrazivanje48@gmail.com

Supplement 2

Serbian translation of the OOPS questionnaire

| U nastavku su navedena pitanja za Vaša iskustva oko spavanja. Molimo Vas da pažljivo pročitate tvrdnje i da za okružite neki od ponuđenih odgovora koji najbolje opisuje Vaša iskustva u prethodne dve nedelje. Odgovore možete zabeležiti na sledeći način: 0 – Nikad ili nimalo; 1 – Retko ili ponekad; 2. Često ili uglavnom; 3 – Skoro uvek ili u potpunosti. | | | | |
| --- | --- | --- | --- | --- |
| U prethodne dve nedelje… | Prostor za odgovore | | | |
| Nimalo ili nikad | Retko ili ponekad | Često ili uglavnom | Skoro uvek ili u potpunosti |
| 1. ... bio/la sam zadovoljan/na koliko vremena sam proveo/la spavajući.(R) | 0 | 1 | 2 | 3 |
| 1. ... umor me je ometao da radim stvari u životu koje su mi važne. | 0 | 1 | 2 | 3 |
| 1. ... dešavalo mi se da nisam siguran/a da li sam spavao/la ili bio/la budan/na, veliki deo noći. | 0 | 1 | 2 | 3 |
| 1. ... osetio/la sam umor u telu kada je trebalo da ustanem | 0 | 1 | 2 | 3 |
| 1. ... iritiralo me je to što nisam mogao/la da zaspim. | 0 | 1 | 2 | 3 |
| 1. ... kada bih se probudio/la osećao/la sam se premoreno i neispavano. | 0 | 1 | 2 | 3 |
| 1. ... u većim delovima dana bio/la sam pospan/a i osećao/la sam se neispavano. | 0 | 1 | 2 | 3 |
| 1. ... bio/la sam zadovoljan/na kvalitetom sna i spavanja. (R) | 0 | 1 | 2 | 3 |
| 1. … osećao/la sam se sveže i odmorno kada se probudim.(R) | 0 | 1 | 2 | 3 |
| 1. ... nerviralo me je to što drugi mogu tako lako da utonu u san i da spavaju. | 0 | 1 | 2 | 3 |
| 1. ... imao/la sam jaku potrebu samo da se dobro ispavam. | 0 | 1 | 2 | 3 |
| 1. ... osećao/la sam da mi je telo „teško“ kada trebam da ustanem. | 0 | 1 | 2 | 3 |
| 1. ... trebalo mi je neko vreme da se u potpunosti probudim i ustanem. | 0 | 1 | 2 | 3 |
| 1. ...u različito vreme sam legao/la. | 0 | 1 | 2 | 3 |
| 1. ... osećao/la sam se premoreno u toku dana. | 0 | 1 | 2 | 3 |
| 1. ... javljale su mi se misli da nešto nije u redu sa mnom zato što ne mogu da spavam. | 0 | 1 | 2 | 3 |
| 1. ... bio/la sam zabrinut/a zato što loše spavam. | 0 | 1 | 2 | 3 |
| 1. ... pokušavao/la sam da se opustim kako bih zaspao/la, ali bez uspeha. | 0 | 1 | 2 | 3 |
| 1. ... ustajao/la sam u različitim vremenima. | 0 | 1 | 2 | 3 |
| 1. ... osećao/la sam očaj zato što ne mogu da se naspavam. | 0 | 1 | 2 | 3 |
| 1. ... imao/la sam utisak da sam izgubio/la sposobnost da dobro spavam. | 0 | 1 | 2 | 3 |
| 1. ... spavao/la sam duže nego obično. | 0 | 1 | 2 | 3 |
| 1. ... spavao/la sam duže kako bih nadoknadio/la izgubljeni san. | 0 | 1 | 2 | 3 |
| 1. ... gubio sam nadu da ću uspeti da spavam dobro. | 0 | 1 | 2 | 3 |
| 1. ... osećao/la sam neudobnosti kada legnem što mi je otežavalo da zaspim. | 0 | 1 | 2 | 3 |
| 1. ... bilo mi je potrebno dosta vremena da se razbudim. | 0 | 1 | 2 | 3 |
| 1. ... imao/la sam utisak da mi život ,,ispašta” zato što ne spavam dobro. | 0 | 1 | 2 | 3 |
| 1. ... obično sam legao/la i ustajao/la u isto vreme od dana do dana. (R) | 0 | 1 | 2 | 3 |
| 1. ... bilo mi je potrebno dosta vremena da zaspim. | 0 | 1 | 2 | 3 |
| 1. ... bio/la sam besan/a zato što nisam mogao/la dobro da spavam. | 0 | 1 | 2 | 3 |
| 1. ... bojao/la sam se za svoje zdravlje zato što nisam spavao/la dobro. | 0 | 1 | 2 | 3 |
| 1. …budio/la sam se usred noći i imao/la sam poteškoće da ponovo zaspim. | 0 | 1 | 2 | 3 |
| Ukupni skor  Za dobijanje ukupnog skora na Skali posledica lošeg spavanja najpre je potrebno obrnuto kodirati čestice 1,8,9 i 28 (0=3, 1=2, 2=1 i 3=0) i pritom ih sabrati sa vrednostima ostalih 28 čestica.  Faktorski skorovi  Loše spavanje i distres (LPD): 3,5,10,16,17,18,20,21,24,25,27,29,30,31 i 32.  Pospanost i letargičnost (PL): 1R,2,4,6,7,8R,9R,11,12,13,15 i 26.  Kompenzatorno spavanje (KS): 22 i 23.  Narušena rutina spavanja i buđenja (NRSB): 14,19 i 28R. | | | | |

Napomena: oko dozvole za upotrebu ove skale obratite se autoru istrazivanje48@gmail.com