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Examining the factor structure, reliability and validity of the Disturbing Dreams and Nightmare Severity Index (DDNSI) consequences sub-component

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Abstract

Background: The Disturbing Dreams and Nightmares Severity Index (DDNSI) is commonly used when assessing the experience of nightmares. It comprises two parts examining i) chronicity and ii) nightmare consequences. The primary aim of the present study was to explore the dimensional structure of the optional and currently unvalidated nightmare consequences component using exploratory factor analysis. Internal reliability and construct validity were also examined. A secondary aim explored the relationships between nightmare chronicity and perceived consequences with measures of anxiety, depression, stress, self-efficacy and insomnia. **Methods:** A cross-sectional survey was conducted with complete data from N=757 students from six UK-based universities Participants completed the chronicity and consequences components of the DDNSI, alongside the Sleep Condition Indicator, Patient Health Questionnaire-9, Generalised Anxiety Disorder-7, Perceived Stress Scale, and General Self-Efficacy Scale. **Results:** Two nightmare consequences factors emerged; 'Sleep-Interference' (4 items; α=.848), and 'Psychosocial Well-being' (6 items; α=.946). Significantly moderate correlations were observed between the two emerging factors and the nightmare chronicity component, as well as with insomnia, anxiety, depression, perceived stress and self-efficacy. Perceived 'Sleep-Interference' (β=-.241) was the strongest predictor of insomnia, and 'Psychosocial wellbeing' was the strongest predictor of anxiety (β =.688) depression (β =.804), perceived stress and lower self-efficacy. **Conclusions:** The perceived nightmare consequences component of the DDSNI is a multidimensional construct comprising of two internally consistent and distinct, but related dimensions. The potential importance of distinguishing between types of perceived nightmare consequences and the associations with mental health outcomes in a student population are highlighted.

Keywords: Nightmares, Factor structure, Students, Mental Health, Sleep.

Introduction

Nightmares are considered to be significantly vivid and dysphoric dreams composed of efforts to avoid threats to survival, security, or physical integrity (American Psychiatric Association [APA], 2013). Often, nightmares are proceeded by startled awakenings with detailed recall of dream content, typically resulting in significant daytime impairment and reduced quality of life (Nielsen et al., 2007; Ohayon et al., 1997). Nightmares may present with levels of typically observed affective arousal (i.e. limbic activation, eye movement, respiratory activity, and sweating) during the REM sleep period (Neilsen & Levin, 2007). Nightmares are considerably prevalent, at a rate of up to 6% of the general population reporting weekly nightmares (Bixler et al., 1979; Janson et al., 1995). This rate is considerably higher during adolescence and young adulthood (Levin & Fireman, 2002) with approximately 19% of young people experiencing frequent severe nightmares (Cranston et al., 2011; Russell et al., 2018). Nightmares are commonly associated with diminished physical and psychological well-being (Blagrove, Farmer, & Williams, 2004; Krakow, 2006; Levin & Fireman, 2002) and the experience of psychiatric difficulties at both symptom and disorder level. Specifically, the experience of nightmares are evidenced to be associated with anxiety, depression (Germain & Nielsen, 2003; Zadra & Donderi, 2000) post-traumatic stress (Krakow, 2006; Semiz et al., 2008) borderline personality disorder (Semiz et al., 2008) and psychosis (Akram et al., 2020; Krakow, 2006; Levin & Fireman, 2002; Sheaves, Onwumere, Keen, Stahl, & Kuipers, 2015).

A culmination of research in the arena of sleep-medicine has called for the classification of nightmares as a distinct and primary sleep disorder which requires symptom-specific treatment above secondary psychological complaints (Spoormaker, Schredl, & van den Bout, 2005; Lancee, Spoormaker, & van den Bout, 2010a; Spoormaker et al., 2006). In relation to objective sleep, the experience of nightmares is related to

decreased total sleep time, increased awakenings, reduced sleep efficiency and sleep initiation difficulties (Germain & Nielsen, 2003). Additionally, an increased level of periodic leg movements in REM sleep and nonrestorative sleep are also commonly associated with nightmares (Germain & Nielsen, 2003). Subjective daytime consequences include the feeling of having too little sleep, in addition to fatigue and reduced productivity (Köthe & Pietrowsky, 2001; Blagrove, Farmer & Williams,2004; Krakow, Tandberg, Sriggins, & Barey, 1995).

Studies utilising polysomnography (PSG) appear to reveal nightmare frequency, whereas retrospective assessments often underestimate the frequency of nightmares, and daily prospective assessments can be burdensome, particularly for individuals suffering nightmares very frequently (Spoormaker, Schredl & van den Bout, 2005). Nevertheless, it is important to assess nightmare characteristics to; identify clinically severe nightmares; distinguish between idiopathic and posttraumatic disorders (Hasler & Germain, 2009); and determine appropriate treatments. Additionally, it is proposed that the impact of nightmares on daily functioning (i.e. nightmare distress), may function as a mediating variable between the experience of nightmares and psychopathologies (Spoormaker, Schredl, & van den Bout, 2005), therefore the assessment of nightmare distress is also paramount. Whilst patient awakenings during/following polysomnographically-determined REM may gain novel patient insight regarding nightmare content, this approach may generally compromise sleep continuity. As such, the content of nightmares, resulting distress and perception of functional impairment largely remain limited to subjective measures.

The Nightmare Distress Questionnaire (NDQ; Belicki, 1992), is commonly used to assess overall concerns regarding the experience of nightmares and subsequentially impact on perceived sleep quality and everyday perceptions (Böckermann, Gieselmann, & Pietrowsky, 2014). However, whilst this tool remains seminal in the examination of nightmares, the NDQ is limited to examination of frequency rather than the severity and intensity of resulting distress, characteristics which have proved more crucial in relation to diminished psychological wellbeing (Akram et al., 2020; Levin & Fireman, 2002; Pietrowsky & Kothe, 2003; Sheaves et al., 2015, 2016). To that end, the Disturbing Dreams and Nightmare Severity Index (DDNSI) (Krakow, 2006) was developed to overcome the NDQ's oversights, by assessing nightmare frequency in addition to the severity of nightmare distress and related adverse consequences. Developed by clinicians and researchers, the DDNSI supports the identification of patients who present with highly disturbing dreams and nightmares (Krakow et al., 2002, Krakow, 2006) and has since been well used in clinical and research settings. The scale consists of two sections which examine nightmare chronicity (severity, intensity, frequency) and perceived impairments attributed to the nightmare disturbance respectively. A composite score of ≥10 on the first section typically indicates the presence of a nightmare disorder requiring treatment, whereas scores ≥20 indicate a clinically severe level of nightmares. The second optional component is open to interpretation due to lack of psychometric validation (Krakow, 2006). Given this, the authors are yet to provide scoring details for items in this latter section which examines the perception of nightmare consequences. As nightmares can be detrimental to day-to-day functioning, exploration of the latent structure of the nightmare distress/consequences component is certainly warranted. Indeed, recent research highlights the predominant role of nightmare intensity and consequential distress, rather than incidence, as key factors in influencing psychiatric difficulties (Akram et al., 2020; Levin & Fireman, 2002; Pietrowsky & Kothe, 2003; Sheaves et al., 2015, 2016).

The present study sought to examine the validity of the DDNSI questionnaire, by: determining the dimensional structure of the 'consequences' component using exploratory factor analysis and examining the reliability and construct validity of the scale in a population of students. Further, as nightmares have been found to be particularly prevalent in young adults (Akram, Gardani, et al., 2020) and given that students are at particularly high risk for both sleep disturbances and mental health problems (Akram, Ypsilanti et al., 2020),

a secondary aim was to explore the associations between nightmare consequences and insomnia, anxiety, perceived stress, self-efficacy and depression in this student sample. We aimed to determine whether it was necessary to distinguish between the type of consequences stemming from nightmares when approaching mental health concerns in students. It was hypothesised that increases in the experience of nightmare consequences would be associated with higher levels of insomnia, anxiety, depression and stress and lower levels of self-efficacy. while controlling for age and sex differences

Method

Sample and Procedure

The study was approved by the Sheffield Hallam University Research Ethics Committee (Protocol number: ER7368595). As part of a wider project examining the mental health difficulties among UK university students, the present study was cross-sectional and questionnaire-based delivered online using the Qualtrics platform. Students from six UK universities were recruited through institutional course participation schemes, social media and faculty emails. All participants provided online informed consent. This resulted in a sample of N=1650 individuals who either began or clicked on a hyperlink to the survey. Only complete cases were used in the analyses due to the participant's ethical right to withdraw from the survey at any time. The data were examined for duplicate responses based on matching IP addresses, where none were found. Students who requested course credit were remunerated on completion. A total of N=1273 respondents completed the study, and out of those, N=757 (86.7% female, 89.2% white, 87.7% undergraduate; 6.9% postgraduate taught, 3.6% postgraduate research; mean age = 20.98 [*SD*= 4.58]) indicated they suffered nightmares and provided full data on the DDNSI questionnaire and were therefore included in the current study.

Participants also completed the Sleep Condition Index (SCI); the Patient Health Questionnaire-9 (PHQ9); the Generalised Anxiety Disorder-7 (GAD7); the Perceived Stress Scale (PSS) and the General Self Efficacy Scale (GSE). Data for the variables of interest were entered into the final analysis.

Measures

Disturbing Dreams and Nightmares

The Disturbing Dreams and Night-mare Severity Index (DDNSI) (Krakow, 2002, 2006) comprises of a 7-item subscale assessing nightmare chronicity and a 10-item subscale assessing the consequences of nightmare disturbances. The first 7 item subscale assesses nightmare frequency (amount experienced per week);number of awakenings due to nightmares (0=never/rarely, 4=always);intensity of nightmares themselves (0=not intense, 6=extremely severe intensity); and the severity of the overall problem (0=no problem, 6=very severe problem). Scores range between 0 and 37, with higher scores indicating greater difficulty with nightmares. Participants may only complete the full questionnaire if at least one monthly nightmare is reported (indicating a score of 1). The subsequent severity is then examined in those completing the full questionnaire. Here, scores ≥ 10 indicate the possible presence of a nightmare disorder which may warrant treatment. Whereas, a score of ≥ 20 indicates a severe level of nightmares such that nightmare disorder is highly probable.

The second 10-item subscale examines the extent of impairments which are perceived to be a consequence of the nightmare disturbance. Here, the summation of statements (e.g. 'my disturbing dreams or nightmares interfere with social or recreational activities': 0=not at all, 3=a great deal) yield a total score ranging between 0 and 30 with higher scores indicating greater perceived consequences of nightmares. Cronbach's alpha for the overall scale in the current study was α =.922.

Insomnia

The Sleep Condition Indicator (SCI) (Espie et al., 2014) is a brief 8-item scale which measures sleep problems against the DSM-5 (APA, 2013) criteria for insomnia disorder. The SCI comprises of two items on sleep continuity, two items on sleep satisfaction two quantitative items on severity and two items on attributed daytime consequences of poor sleep. Each item is scored on a scale from 0-6 and summated to obtain the SCI total score of between 0-32. Higher scores relate to better sleep. Validation studies have shown the SCI is valid, reliable and sensitive to change (Espie et al., 2014). Cronbach's alpha in the current study was α =.856.

Anxiety

The 7-item Generalized Anxiety Disorder Scale (GAD-7; Spitzer et al., 2006) is a validated practical self-report anxiety questionnaire used in primary care. The tool asks respondents how often, during the last 2 weeks, they have been bothered by each of the 7 core symptoms of generalized anxiety disorder. Responses choice are 0 = "not at all"; 1 = "several days"; 2 = "more than half the days"; and 3= "nearly every day". Total scores range between 0 and 21 with cut offs of ≥5, ≥10, and ≥15 indicating mild, moderate, and severe anxiety levels, respectively. The GAD-7 has been shown to exhibit good reliability, as well as criterion, construct, factorial, and procedural validity (Spitzer et al., 2006; Löwe et al., 2008). Cronbach's alpha in the current study was α =.919.

Depression

The 9-item patient health questionnaire (PHQ-9; Kroenke, Spitzer & Williams, 2001) is a brief self-report depression scale used to assess depressive symptoms in the general population. Each of the nine depressive symptoms correspond to the depression criteria of the DSM-V (APA, 2013). Respondents are required to indicate how much, during the previous 2 weeks, the symptom has bothered them on a scale of: 0="not at all", 1="several days", 2="more than half of the days" or 3="nearly every day". Total scores indicate depression severity and range from 0 to 27 with higher scores indicating higher levels of depression. The scale has been shown to demonstrate good criterion and construct validity (Kroenke et al., 2001; Kroenke &Spitzer, 2002). Cronbach's alpha in the current study was α =.902.

Perceived Stress

The Perceived Stress Scale: (PSS: Cohen et al., 1994) examined appraisal of stress levels over the past month. Fourteen items, scored on a 5-point scale (0–4), are summed to provide total scores ranging between 0 and 56. Higher scores indicate higher levels of perceived stress. The internal consistency of the scale in the present study was α =.872.

Self-Efficacy

Perceived self-efficacy was assessed using the General Self-Efficacy Scale (GSE: Schwarzer & Jerusalem, 1995). Ten items examine an individual's beliefs about personal ability to handle new and difficult tasks. Example items include "Thanks to my resourcefulness, I can handle unforeseen situations" and "I am certain that I can accomplish my goals". Items are scored on a 4-point scale, ranging from 1 (not at all true) to 4 (exactly true). Item responses are summated to produce a total score ranging between 10-40, with higher scores indicating greater levels of self-efficacy. The internal consistency of the scale in the present study was α =.806.

Treatment of Data

Exploratory factor analysis (Principal axis factoring) with direct Oblimin rotation to allow the factors to be correlated (Corner, 2009) and Kaiser Normalization (Kaiser, 1960) was conducted using IBM SPSS 26. This

was chosen as the most appropriate statistical method in order to identify the latent construct structure of the DDSNI (Warner, 2012). The Kaiser-Meyer-Olkin measure verified the sampling adequacy for the analysis (KMO=.912 (meritorious according to Hutchenson & Sofroniou, 1999). Bartlett's test of Sphericity also showed a significant result (BS (45) = 4510.69, *p>*.001. Therefore, both tests suggested the suitability of the data for factor analysis. The 10 items of the consequences scale were entered into the factor analysis and factor loadings greater than .35 were considered significant as this level of significance has been recommended as appropriate in samples sizes about 250 (Hair et al., 2006). Velicer's MAP test and parallel analysis (with the 95th percentile eigenvalues being estimated based on 1,000 datasets with permutation) were conducted and both indicated a two-factor solution. Therefore, the factor analysis was set to extract two factors.

The internal consistency of the factors was examined using Cronbach's alpha (Cronbach, 1951). To examine construct validity Pearson's correlations were conducted between the factors and the total nightmares consequences scores, and the nightmare chronicity scores. To explore criterion validity Pearson's correlations were conducted between the factors and the SCI, GAD7, PHQ9 PSS, and GSE. Sex differences were assessed with independent samples t-test and Pearson's bivariate correlations assessed the relationship with age. Hierarchical multiple regression analyses (using enter method) were implemented (controlling for age and sex in step 1) to assess which of the DDNSI components were the greatest predictors of insomnia, anxiety, perceived stress, self-efficacy, depression with SCI, GAD7, PSS, GSE and PHQ9 scores entered as the dependent variables, respectively. The nightmare consequences factors (as determined by the factor analysis) plus nightmare chronicity were entered in step 2, as predictors in each model. Given that sleep problems, as well as anxiety and depression levels are generally higher in both females and younger people (Altemus, Sarvaiya & Epperson, 2014; Schredl & Pallmer, 1998; Siversten et al., 2009; Zhang & Wing, 2006), age and gender were entered in the regression analyses as covariates.

Finally, to examine the incremental validity of using the resulting factors in comparison to the total consequences score, a further set of multiple regression models were calculated in which the total consequences score was entered at step 1, and the individual factor scores entered at step 2. Models were calculated for insomnia, anxiety and depression as these were the main sleep and mental health related outcomes in the current study.

Results

Factor structure of Nightmare Consequences

The pattern matrix factor loadings and eigen values are presented in table 1. Two factors were extracted from the factor analysis accounting for 68.81% of the overall variance. The factors were named 'Sleep-Interference' which comprised of sleep-related consequences; and 'Psychosocial Well-being 'which comprised of impairments to aspects of mood, relationships and daily functioning All items are shown in table 1.

-Table 1 here-

Reliability and validity

Cronbach's alpha for the Total Nightmare Consequences scale (10 items) α=.922 and for each factor were; 'Sleep-Interference' (4 items) *α*= .848, and 'Psychosocial Well-being' (6 items), *α* =.906. As shown in table 2 Pearson's bivariate correlations showed significant large (>.50) correlations between the 'Sleep-Interference' and 'Psychosocial Well-being' factors. Large positive correlations were also apparent between each factor and the Total Nightmare Consequences and the Nightmare Chronicity component. Moderate (.30 -.50) positive correlations were observed between 'Sleep-Interference' and the PHQ9, GAD7 and PSS, a moderate negative correlation was observed with the SCI and a small (<.30) negative correlation with the GSE.

Marginally large (>.50) positive correlations were observed between 'Psychosocial Well-being' and both the PHQ9 and GAD7, a moderate positive correlation with the PSS. A moderate negative correlation was observed between 'Psychosocial Well-being' and the SCI, and a small negative correlation with the GSE. Nightmare Chronicity was also significantly moderately correlated with the SCI, GAD7 and PHQ9, and a small correlation was observed with the GSE. Correlation coefficients and mean scores for each measure are shown in table 2.

-Table 2 here-

Demographics

Age was significantly positively correlated with Nightmare chronicity (r=.139, p<.001), Total Nightmare Consequences (r=.129, p<.001), Psychosocial-Well-being (r=.146, p<.001), and Sleep-Interference (r=.072, p=.046) albeit weakly. With regards to gender, females scored significantly higher than males on total Nightmare Chronicity [t(754)=2.34, p=.020], Total Nightmare Consequences [t(754)=4.66, p<.001], 'Sleep-Interference' [t(754)=5.44, p<.001], and 'Psychosocial Wellbeing'[t(754)=3.41, p<.001].

Associations with insomnia, anxiety and depression

The regression model including age and sex as predictors of SCI scores was significant [F(2,754)=22.45, p<.001] at step 1 predicting 5.6% of the variance. The addition of DDSNI components to the model was also significant at step 2 [F(5,751)=62.15, p<.001] predicting an additional 23.6% of the variance in SCI scores. Age, gender, 'Sleep-Interference' and 'Well-being Consequences' were significant predictors in the final model (p<.05), with Sleep-Interference the strongest predictor (β=-.594, p<.001) closely followed by 'Psychosocial Well-being ' (β=-.231, p<.001). Nightmare chronicity was not a significant predictor in the final model (β=-.106, p=.059).

The model including age and sex at step 1 was significant [F(2,754)=6.14, p=.002], predicting 1.6% of the variance in GAD7 scores. The addition of DDSNI components to the model was also significant at step 2 [F (5,751)=96.06, p<.001] predicting an additional 27.3% of the variance. Nightmare Chronicity (β =.127, p=.008) and 'Psychosocial-Well-being' (β=.688, p<.001) were the only significant predictors in the final model, with 'Psychosocial-Well-being' the strongest predictor of anxiety scores. 'Sleep-Interference' was not a significant predictor in the final model (β=.046, p=.638).

The model including age and sex as predictors of PHQ9 scores was significant [F(2,754)=3.31, p=.037] at step 1 but predicted only 0.9% of the variance. At step 2 the addition of DDSNI components was also significant [F(5,751)=62.07, p<.001] predicting an additional 28.4% of the variance in PHQ9 scores. Nightmare Chronicity (β=.112, p=.033) and 'Psychosocial-Well-being' (β=.804, p<.001) were again the only significant predictors in the final model, with 'Psychosocial-Well-being' the strongest predictor of depression scores. 'Sleep-Interference' was not a significant predictor in the final model (β=.044, p=.687).

Associations with stress and self-efficacy

The model including age and sex as predictors of PSS scores was significant [F(2,754)=5.59, p=.004] at step 1. The model at step 2 was also significant [F(5,751)=27.37, p<.001] predicting an additional 23.4% of the variance in PSS scores. In the final model, age (β=-.131, p=.009), 'Psychosocial-Well-being' (β=.666, p<.001) and Nightmare Chronicity (β=.185, p=.006) were significant predictors in the final model. 'Sleep-Interference' (β=.158, p=.168) was not a significant predictor of PSS scores.

The model including age and sex as predictors of GSE scores was also significant [F(2,754)=5.30, p=.005]. The model at step 2 was significant [F(5,751)=17.35, p<.001] predicting 9.2% of the variance. Age (β=.804, p<.001) and 'Psychosocial-Well-being' (β=-.337, p<.001) were the only significant predictors in the final model

and were negatively associated with levels of self-efficacy. Sleep-Interference (*β*=-.106, *p*=.249) and Nightmare Chronicity (*β*=.004, *p*=.939) did not predict GSE scores.

Incremental validity

The model with insomnia as an outcome indicated that using the 2-factor solution increased the predictive validity of the model (amount of variance explained) by 0.01% (ΔR^2=.001) in relation to using the total nightmare consequences score alone (1-factor solution), however this change was not significant [F(754)=1.177, p=.278].

With respect to mental health outcomes, the model in which depression was the outcome showed that the 2 factor solution increased the predictive validity of the model by 2% (ΔR^2=.020) and this change was significant [F(754)=20.829, p<.001). Finally, the model for anxiety also showed that the 2 factor solution increased the predictive validity of the model by 1.4% (ΔR^2 = .001) and this change was also found to be significant [F(754)=15.042, p<.001).

Discussion

The primary aims of the current study were to establish the dimensional structure of the 'consequences' component of the DDNSI (Krakow, 2006), examine the reliability of the scale and explore the associations between nightmare consequences and insomnia, anxiety, perceived stress, self-efficacy and depression. The results of the factor analysis indicated that two clear factors emerged from the 10 items of the DDSNI consequences component. These were named 'Sleep-Interference' and 'Psychosocial Well-being'. Unsurprisingly, the 'Sleep-Interference' factor comprised of items related to reduced sleep quality and the difficulties falling and staying asleep due to nightmares. In contrast, the 'Psychosocial Well-being' component comprised of the effect of nightmares on individual's mood, mental and physical health, social activities, relationships and work performance. Both factors exhibited excellent internal consistency (>.80) indicating the items within each factor reliably measured similarly related concepts. This was supported by no items cross loading (larger than .35) onto each factor. Further, both 'Sleep-Interference' and 'Psychosocial Well-being' significantly correlated with the first component of the DDNSI 'Nightmare Chronicity' indicating convergent validity as both types of consequences were related to the severity and intensity of nightmares experienced.

Sleep-Interference, Psychosocial-Well-being and Nightmare Chronicity were each related to symptoms of anxiety, depression and insomnia, as well as increased perceived stress and lower self-efficacy, further supporting previous interrelationships between disturbing dreams and nightmares, disturbed sleep, and psychiatric difficulties (Akram, Gardani et al., 2020; Germain & Nielsen, 2003; Sheaves et al., 2015, 2016; Zadra & Donderi, 2000). Sleep interference was most strongly associated with insomnia, whereas Psychosocial well-being had the strongest association with depression, and anxiety indicating these two factors are somewhat distinct. Whilst the current findings may not be particularly surprising, divergence in the predictive value of different nightmare variables in relation to disturbed sleep and mental health outcomes were perhaps equally as noteworthy. Here, regression analyses failed to evidence the composite Nightmare Chronicity score (i.e. the severity, frequency and intensity of nightmares) to be significantly related to reports of insomnia symptoms when controlling for age and sex. In contrast, Sleep-interference and Psychosocial well-being were related to insomnia, with sleep-interference being the strongest predictor in the model. However, when examining the potential incremental validity of the 2-factor solution and whether it may have some additional predictive value over and above the use of single nightmare consequences score, it was demonstrated that using the two factors could improve the fit of the models for mental health related outcomes (i.e., anxiety and depression), but did not provide significant additional predictive power when it came to the sleep related (i.e.,

insomnia) outcome in the current study. These findings may suggest that considering the types of nightmare consequences separately may have a better predictive value than considering them as one construct, particularly when it comes to assessing the effect of nightmares on distinct psychological outcomes. That said, nightmare chronicity was related to greater levels of anxiety and depression, as measured by the GAD7 (Spitzer et al., 2006) and PHQ9 (Kroenke, Williams & Spitzer, 2001), but was not associated with levels of either perceived stress or self-efficacy. Psychosocial Well-being was the strongest predictor of anxiety, depression, self-efficacy and perceived stress, whereas Sleep-Interference was not associated with these outcomes.

These outcomes support previous evidence in university students whereby the experience of nightmare distress is more predictive of common mental health problems rather than nightmare incidence itself (Levin & Fireman, 2002) However, our work demonstrates that the nature of perceived nightmare consequences may be related to different symptoms. In particular, perceived sleep-interference resulting from the experience of nightmares appear distinctly associated with sleep-related concerns, whereas the notion that nightmares affect psychosocial well-being (e.g. mood, health and work) are linked to increased reports of anxiety and depression. Certainly, a complex bidirectional relationship in which anxiety, stress and depression can exacerbate nightmare related distress and vice versa, remains likely, and warrants additional longitudinal examination. Although logical, it is equally unexpected, given the complex nature of the sleep and mental health interaction (e.g. Baglioni et al., 2016; Milojevich & Lukowski, 2016), that perceived sleep-interference failed to predict anxiety and depression. This alone adds to the culmination of literature suggesting the nightmare experience to be more than just epiphenomenal in the context of mental health difficulty.

The current sample was entirely comprised of students, further exemplifying the weight of these issues within the student population. The prevalence of suicidal ideation in students (c.f. 42.2%; Akram, Ypsilanti et al., 2020) remains consistently higher than in the general population (1.1-19.8%; Casey et al., 2008) and disturbed sleep and nightmare experiences have previously been associated with suicidality (Bernert & Joiner, 2007; Nadorff, Nazem, & Fiske, 2011; Sjöström, Waern, & Hetta, 2007). With that in mind, in the larger study from which the current data was drawn, the experience of nightmares were reported by 61% of students, highlighting the problematic prevalence of nightmares in this population. Together, our findings highlight the relevance of examining perceived consequences of nightmares and more specifically reports of sleep-interference and psychosocial impairments when addressing mental health concerns within this population. Indeed, it is well established that disturbed sleep negatively impacts student life. However, considering persistent alterations to the circadian rhythm which may result from a number of factors including shift work, late night studying, sleep-onset insomnia in periods of stress (e.g. exam terms) it is suggested that students should receive specialized sleep treatments (Schlarb, Friedrich, & Claßen, 2017) in which students' circumstances, as well as environmental and biological factors are addressed. Given the nuanced experience of nightmares and increased risk of psychiatric difficulty in this population, treatments for nightmares may follow suit. Here, a combination of sleep education and regular screening for nightmare and other sleep disorder symptoms amongst students, with or without co-occurring psychiatric difficulty, should guide student-support services when making judgments regarding an appropriate treatment approach (Akram et al., 2020). For example, sessions comprised of brief image-focused CBT intervention for nightmares (Sheaves et al., 2019).

Several limitations of this study must be acknowledged. Firstly, all measures were self-administered online, which although this allowed for wider recruitment across universities resulting in a large sample size, is accompanied by the usual issues of potential self-report bias. Nightmares can only really be assessed via a subjective account, given how they're experienced. That said, nightmare content, resulting distress and perception of functional impairment also remain limited to subjective measures. Nevertheless, whilst this approach remains subjective in absence of objective measures, the DDSNI has been deemed reliable measure

of nightmare symptoms, with evidence of convergent validity. Next, only UK university students were sampled, and the sample comprised largely of young white females, which although is common with online surveys (Smith, 2008) potentially presents a further source of bias. That said, females often report sleep disturbances and nightmare at a higher rate than males, as well as high levels of anxiety, depression and stress (Altemus, Sarvaiya & Epperson, 2014; Schredl & Pallmer, 1998; Siversten et al., 2009; Zhang & Wing, 2006). Further, the sample mainly comprised of undergraduate students, therefore the current findings are not entirely generalizable to the general population or indeed the whole student population across the UK. It therefore remains vital to examine the validity of the currently identified dimensions in more representative student and general population samples in order to reliably extrapolate the current outcomes.

In conclusion, the present outcomes highlight the DDNSI as a reliable measure of disturbing dreams and nightmares. The nightmare consequences component appears to be a multidimensional construct comprising of distinct yet related dimensions which examine the impact of nightmares on both sleep and psychosocial wellbeing. The components are internally consistent and demonstrate convergent validity. Our findings highlight the potential importance of distinguishing the perceived consequences of the nightmare experience, particularly when examining its relationship with disturbed sleep (i.e. insomnia), poor self-efficacy and symptoms of anxiety, depression and perceived stress. Adequate screening for nightmare symptoms may be useful in guiding clinicians and other support services when implementing treatment plans for students with consistent symptoms, specifically when considering the differential impacts on the individual (i.e. sleep-interference and psychosocial wellbeing). In addition, the new dimensional structure may prove useful for those aiming to examine a number of parameters relating to the experience of nightmares (i.e. severity, intensity frequency, resulting awakenings and perceived consequences) without compromise to objective sleep continuity.

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Table 1.
Pattern Matrix Factor loadings for each of the 10 nightmare consequences items

Items	Rotation factor loading	
My disturbing dreams or nightmares…	Factor 1: Sleep Interference	Factor 2: Psychosocial Well-being
…cause me to lose sleep	.807	-.054
…make it difficult to fall asleep	.627	.074
…interfere with the quality of my sleep	.737	.086
…make it difficult to sleep through the night	.811	-.002
…interfere with my mood	.157	.603
…interfere with my mental health	.134	.709
…interfere with my physical health	.155	.654
…interfere with social or recreational activities	-.095	.879
…interfere with my school or work performance	.073	.776
…interfere with my relationships	-.126	.900
Eigen values	1.272	5.608

Table 2.
Bivariate Pearson's correlations showing relationships between each factor, with total consequences, nightmare chronicity, insomnia, depression, anxiety, perceived stress, and self-efficacy (Mean scores [SD]).

	1	2	3	4	5	6	7	8	9
1. Total Nightmare consequences	-	.854**	.939**	.561**	-.519**	.512**	.517**	.477**	-.291**
2. Sleep Interference		-	.623**	.560**	-.461**	.375**	.369**	.369**	-.223**
3. Psychosocial Well-being			-	.474**	-.476**	.522**	.534**	.473**	-.290**
4. Nightmare chronicity				-	-.368**	.329**	.329**	.319**	-.140**
5. Insomnia (SCI)					-	-.489**	-.610**	-.478**	.254**
6. Anxiety (GAD7)						-	-.758**	.721**	-.433**
7. Depression (PHQ9)							-	.747**	-.445**
8. Perceived Stress (PSS)								-	-.545**
9. Self-efficacy (GSE)									-
Mean score [SD]	8.18 [6.24]	4.15 [2.74]	4.03 [4.15]	11.61 [4.10]	16.16 [7.25]	10.64 [6.13]	11.72 [6.80]	22.50 [7.08]	27.60 [5.12]

Note: **Sig at p<.001