# Examining when nightmare distress and frequency improve across treatment sessions in a child sample: Which improves first?

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*Summary*. Theories of nightmare persistence suggest that the distress experienced as a result of a nightmare creates and sustains a coercive nightmare cycle. However, changes in nightmare distress and frequency throughout treatment have not been studied in a session-by-session manner to observe week-to-week change. We sought to understand how characteristics of nightmares may relate to breaking a cycle of nightmares in order to disrupt nightmare persistence. We examined changes in nightmare distress and nightmare frequency in a cognitive-behavioral treatment for nightmares for children, specifically to test the theory that nightmare distress drives the nightmare cycle. Seventeen children between the ages of 5 to 17 participated in a brief, five-session cognitive behavioral therapy to address their trauma-related nightmares. Data from baseline, five therapy sessions, and post-treatment were used in the analyses. Helmert's contrasts were used to examine improvement over time by comparing the mean of each variable at each progressive time point to the mean of the subsequent time points. While treatment was significantly related to reduced nightmare distress and frequency from baseline to post-treatment, our findings did not support the hypothesis that nightmare distress would improve before nightmare frequency. Nightmare distress increased in the week from baseline up to the first treatment session, and then steadily declined across all five treatment sessions. Nightmare frequency saw a steady decline from baseline to session three, and then stabilized. Implications for understanding the nightmare cycle are discussed along with treatment implications.

*Keywords:* Nightmares, nightmare treatment, trauma, nightmare severity, cognitive-behavioral therapy, nightmare frequency, nightmare distress

## 1. Introduction

The occasional nightmare is common and is considered typical during childhood. Conversely, repeated or frequent nightmares that persist over time are less common and are associated with increased mental health difficulties (Schredl et al., 2009), including suicidality (Liu, 2004; Stanley et al., 2017). A recent systematic review of nightmare prevalence in youth found that prevalence rates of nightmares within clinical populations ranged from 27% to 57% in the past week and 18% to 22% in the past month (El Sabbagh et al., under review). Comparatively, the prevalence rates of nightmares within nonclinical populations ranged from 1% to 11% in the past week and 25% to 35% in the past month. Findings showed differences between child and parent reports such that children typically reported higher rates of nightmares than did their parents, except within a clinical population where there was less disagreement between child and parent reports (El Sabbagh et al., under review).

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Nightmares can be idiopathic, originating from an unknown etiology (Hasler & Germain, 2009), or they can begin following a trauma, which are usually known as posttraumatic nightmares (PTN; Langston et al., 2010). Although PTN are considered a hallmark symptom of posttraumatic stress disorder (Germain, 2013), they can warrant a diagnosis of nightmare disorder when the clinician deems that they need clinical attention (*Diagnostic and Statistical Manual of Mental Disorders*; 5th ed., text rev.; *DSM-5-TR*; American Psychiatric Association [APA], 2022). About 3-6% of youth in pediatric samples and 10-12% of youth in psychiatric populations have nightmare severity significant enough to be considered a disorder (El Sabbagh et al., under review). According to the *DSM-5-TR*, the condition is characterized by "repeated occurrences of extended, extremely dysphoric, and well-remembered dreams" that typically result in awakening and cause clinically significant distress or impairment in functioning (APA, 2022, p. 457).

Nightmare distress and frequency inform the diagnosis of nightmare disorder (Belicki, 1992; Gieselmann et al., 2019). Nightmare frequency refers to the number of nightmare episodes one experiences within a given time frame. In the *DSM-5-TR*, nightmare frequency is used to determine the "severity" specifier for nightmare disorder with "mild" being less than once weekly, "moderate" being one or more episodes per week, and "severe" being nightly episodes (APA, 2022, p. 457). Researchers often identify a minimum frequency of nightmares (e.g., at least one nightmare per week for at least one month) as a component of a study's inclusion criteria (e.g., Krakow et al., 2001; Kunze et al.,

2016) suggesting that frequency is the key criterion for determining pathology. Recently, however, Miller et al. (2019) found that the nightmare symptom severity, computed as a combined distress and frequency score, predicted whether adults initiated participation in a nightmare treatment study. The results from Miller and colleagues suggest that distress is important in understanding nightmare pathology.

Researchers examining nightmare distress have found that distress modulates the nightmare frequency-psychopathology association (e.g., Belicki, 1992; Blagrove et al., 2004). The dreamer's subjective rating of distress is related to overall well-being and comorbid psychopathology (Blagrove et al., 2004; Böckermann et al., 2014; Schredl et al., 2019). If nightmare distress is sufficient to cause awakening, nightmare distress can be attributed to causing the resulting sleep fragmentation and to maintaining a cycle the results in nightmare chronicity.

## A Model of Nightmare Persistence

Nightmares are hypothesized to be a learned behavior resulting from the brain's failure to process negative stimuli during sleep. If negative stimuli are successfully processed during dreaming, the brain integrates negative memories into other cognitive processes and extinguishes fear; the waking that results from nightmares interferes with fear extinction (Levin & Nielsen, 2009) and awakening reinforces or encourages more nightmares by reducing the associated distress the dreamer experiences (Gieselmann et al., 2019). Bad dreams are distinct from nightmares in that they do not cause awakening. The awakening criterion not only helps to define nightmares but also helps to understand them. By awakening the dreamer, the dreamer avoids the negative emotion, and therefore awakening not only results in the maintenance of distress (i.e., failure of fear extinction), but it increases the occurrences of nightmares. Researchers hypothesize that in a bad dream the negative salience of stimuli is sufficiently neutralized (Spoormaker, 2008), and bad dreams are evidence of successful fear extinction (Levin & Nielsen, 2009). Therefore, high levels of dream distress result in awakening and can consequently strengthen the nightmare script (Levin & Nielsen, 2007), reinforce the fear causing the memories to be resistant to extinction, and perpetuate a cycle of recurrent nightmares (Spoormaker, 2008). The cycle results in nightmare persistence. This theory suggests that if the negative emotionality or distress can be reduced sufficiently to stop the dreamer from awakening, then the nightmare cycle can be broken. In other words, if distress can be reduced, nightmare persistence should mitigate because the dreamer will not need to wake up to avoid the distress.

Davis (2008) described a pernicious cycle in adults in which a high level of nightmare distress can result in daytime rumination about the nightmare. Daytime rumination can result in increased anticipatory bedtime anxiety and poor coping, such as bedtime and sleep avoidance. Sleep avoidance increases fear and reduces opportunity for alternative learning for positive associations with sleep (e.g., that sleep can be restorative). The anticipatory fear and rumination increase the likelihood of negatively valanced dreams and nightmares. Davis' (2008) theory has resulted in a multipronged treatment approach that addresses daytime stress and anticipatory nighttime anxiety, in addition to directly treating the nightmare.

## Treatment to Disrupt the Nightmare Cycle

Rousseau and Belleville (2018) identified six treatment processes that theoretically may disrupt the nightmare cycle. The modal theme that emerged from their review was that achieving a sense of mastery over nightmares was associated with treatment gains. A sense of mastery suggests that one's belief about their inability to control their nightmares fuels the nightmare cycle. A second theme the authors identified was that treatment that allowed for emotional processing of nightmare content through exposure remedies the failure of natural dream processes that normally allow for fear extinction, presumably reducing nightmare avoidance, which results in a break of the nightmare cycle. This emotional processing subsequently reduces avoidance, allows for new learning, and reduces distress. Rousseau and Belleville (2018) identified a third explanation for treatment efficacy, in the modification of negative beliefs regarding nightmares. For this mechanism, it is thought that the maladaptive beliefs one has of their nightmares perpetuate their reoccurrence. Fourth, according to Rousseau and Belleville (2018), is restoring healthy sleep function that was impaired by the nightmare cycle and improving one's overall sleep in order to disrupt the nightmares. The fifth proposed explanation is decreasing the individual's arousal to their nightmares. The authors highlight that decreased arousal could occur at various stages, such as before falling asleep and not solely in response to awakening from the nightmare. Prevention of avoidance is the sixth and final proposed explanation for nightmare treatment efficacy. The authors suggest that, through teaching individuals various coping strategies (e.g., relaxation), avoidance is prevented, thus disrupting the maintenance of nightmares. Rousseau and Belleville (2018) asserted that effective nightmare treatments target all six aspects of the nightmare cycle, and that these aspects can work in concert throughout treatment, rather than each being a separate competing theory. Interestingly, only the first theme, mastery of nightmares, suggests that frequency is a crucial treatment target for nightmare healing. The remaining purported mechanisms all suggest that nightmare distress and fear extinction are at the heart of addressing the coercive nightmare cycle.

## Current Study

Theories of nightmare persistence suggest that the distress surrounding the nightmare creates and sustains a nightmare cycle (Davis, 2008; Levin & Nielsen, 2007). This theory is further supported by the proposed mechanisms of nightmare disruption in treatment, which purports that interventions targeting distress most predominantly account for nightmare healing (Rousseau & Belleville, 2018). *DSM-5-TR* diagnostic criteria also point to the importance of distress, such that distress is required for the diagnosis of nightmare disorder (APA, 2022). If distress maintains a cycle of nightmare persistence, then we expect that distress would mitigate before frequency when the cycle of nightmares is broken. Understanding when distress and frequency remit across a treatment trajectory would inform nightmare theory development and treatment recommendation and planning. Thus, the current study sought to examine the mitigation of nightmare distress and frequency in a cognitive behavioral therapy for nightmares in children (CBT-NC) from baseline assessment, across five weeks of treatment, to a post-treatment assessment. Specifically, the present investigation

sought to examine when statistically significant changes in nightmare distress and in nightmare frequency occurred over the course of five sessions in order to determine which started to improve first. We predicted that distress would improve sooner than frequency.

## 2. Method

### 2.1. Participants

Participants were children between the ages of 5 to 17 years experiencing PTN (*M* = 12.18 years, *SD* = 4.14 years). The mean age of onset for PTN was approximately six-years-old (*M* = 6.29 years, *SD* = 3.53 years), suggesting an average chronicity of six years in the current sample. A total of 17 participants suffering from PTN completed the five-session nightmare treatment. Of the 17 participants, nine were girls (52.9%) and eight were boys (57.1%). The sample self-identified as 47.1% White (*n* = 8), 5.9% African American (*n* = 1), 5.9% Hispanic (*n* = 1), 11.8% Native American (*n* = 2), and 29.4% Multiracial (*n* = 5). Participants reported a mean of 4.1 traumatic events (*SD* = 2.69, range = 1-9). Youth were queried about lifetime history of trauma. The following experiences were reported: 29.4% natural disaster (*n* = 5); 41.2% serious accident (*n* = 7); 23.5% hit, punched, or kicked very hard (*n* = 4); 29.4% witnessed a family member being hit, punched, or kicked very hard (*n* = 5); 41.2% beaten up, shot at, or hurt badly (*n* = 7); 17.6% witnessed someone being beaten up, shot at, hurt badly, or killed (*n* = 3); 17.6% saw a dead body (*n* = 3); 29.4% someone touched their private parts (*n* = 5); 52.9% violent death/serious injury of a loved one (*n* = 9); 17.6% scary medical procedure (n = 3); 5.9% forced to have sex (*n* = 1); 52.9% someone close died (*n* = 9). Four participants (23.5%) were missing data for the item querying if someone close to them had passed away.

Inclusion criteria for the study was being aged 5 to 17-years-old, having at least one nightmare per week for at least one month and nightmare onset was either following a traumatic event, or exacerbation of nightmares to the current levels were following a traumatic event. Participants also had to have a parent who was able to read and speak English and able to participate with the child. Exclusion criteria was presence of any significant developmental delays, apparent psychosis, or if those currently taking medication had not had consistent intake for the past month. No children were excluded from the study due to these criteria.

### 2.2. Procedure

This study was part of a larger research study investigating the efficacy of a modified nightmare treatment for children experiencing PTN. The study procedures were approved by The University's Institutional Review Board and the study was registered with ClinicalTrials.gov (NCT01776229). Informed consent from parents and child assent were obtained at the baseline appointment. All assessment and treatment sessions were conducted by graduate students who were supervised by a licensed clinical psychologist. Treatment sessions were 60-90 minutes long. Baseline and post-treatment assessments were two to three hours long. Parents were compensated with a $15 gift card for the post-treatment assessments, and children chose a small gift from a treasure box after each visit (e.g., socks, toy, gel pens).

### 2.3. Treatment

Cognitive Behavioral Treatment for Nightmares in Children (CBT-NC; Fernandez et al., 2013) is a brief, five-session treatment for children experiencing PTN. The following is a description of the five sessions (Fernandez et al., unpublished workbook).

Module one provided psychoeducation about trauma and normalized nightmares. There was an instilling hope activity in order to increase motivation and treatment engagement. Caregiver and child were oriented to homework and what to expect for the duration of treatment.

Module two provided psychoeducation about nightmares and sleep habits. Both unhelpful and helpful habits of sleep were identified, and new sleep routines began to be shaped.

Module three's psychoeducation was about physiological responses to stress and nightmares. Progressive muscle relaxation was practiced in session and established for practice at home. The children also decorated a pillowcase with positive words and designs, which was taken home to be used on their beds; this served as a way to help the child think positively and associate positive thoughts and feelings with bedtime.

The treatment target for module four was exposure to the original nightmare and then rescription of a new narrative. The children wrote or drew their scariest nightmare; if they had more than one, they chose the most distressing. The children were encouraged to include as much detail as possible (i.e., using all five senses) and to use present tense as if the nightmare were occurring in the current moment. Nightmare themes were discussed, which were based on trauma themes (Resick & Schnicke, 1993). After the nightmare was rescripted based on the identified theme(s), the child was taught slow breathing as a new relaxation skill. This skill was meant to decrease arousal and increase the child's self-efficacy by helping them feel self-control.

Module five focused on relapse prevention and planning for future difficulties that may arise. Child and therapist reviewed treatment progress and skills mastered. Future planning/anticipated use of learned skills were discussed. Finally, diaphragmatic breathing was learned, and the child received a mastery certificate.

### 2.4. Measures

#### *2.4.1 Demographic Questionnaire*

A demographic questionnaire was administered to the caregivers at the baseline assessment, gathering information, such as the child's age, gender, ethnicity, and grade level.

#### *2.4.2 University of California Los Angeles (UCLA) PTSD Reaction Index for Children and Adolescents (Steinberg et al., 2004)*

The UCLA PTSD Reaction Index is a clinician-administered interview that assesses trauma exposure history and post-traumatic symptoms among children aged 6-18. The DSM-IV version was utilized in this study until the DSM-5 version was published. For both versions, children indicate on a 5-point scale how often they experienced specific PTSD symptoms over the last month, with higher scores indicating greater PTSD symptom experience. Both the DSM-IV and DSM-5 versions have excellent internal consistency

(α = .88-.91; α = .85, respectively) (Elhai et al., 2013; Steinberg et al., 2013; Takada et al., 2018).

#### 2.4.3 *Trauma-Related Nightmare Survey [Modified Child Version] (Davis & Wright, 2007)*

The Trauma-Related Nightmare Survey Child Version (TRNS-CV; Langston & Davis, 2008) is a 16-item self-report instrument that was modified for children and adolescents. The measure was adapted from the adult version, The Trauma-Related Nightmare Survey (TRNS; Davis et al., 2001). In the modified instrument, children are queried about their nightmares (i.e., frequency, distress, content), current sleep quality, and related cognitions, emotions, and physiological behaviors related to the nightmare. The TRNS-CV was used in this study to measure nightmare frequency and nightmare distress. Nightmare frequency was measured utilizing item 11: "In the last week, how many nights did you have a nightmare?" The frequency of the participants' nightmares was coded as *none* (0), *1-2 nights* (1), *2-3 nights* (2), *5-6 nights* (3), or *every night* (4). To measure nightmare distress, the summation of the related quantitative questions was used to compute a nightmare distress variable (Item 1: "How scared are you about going to sleep?; Item 2: "How sad or down do you feel when you wake up?; Item 4: "How upsetting have the nightmares been?"). The participants were asked to indicate their level of distress corresponding to each item as *not at all* (0), *a little bit* (1), *some* (2), *a lot* (3), and very much (4). The total possible score for nightmare distress ranged from 0 to 12. There is no psychometric information available for the child version of the TRNS, however, the adult version has demonstrated good test-retest reliability ($r$ = .73) and moderate to strong convergent validity ($r$ = .44 -.78) with measures of sleep and PTSD symptomatology (Cranston et al., 2017). In the current sample, Cronbach's α = .79.

### 2.5. Data Cleaning and Analytic Procedure

Data were screened for any potential deviations from normality. Nightmare distress did not violate tests for normality when examining the skewness and kurtosis statistics for every time point. However, nightmare frequency was positively skewed at session three and post-treatment. As all nightmare frequency data were skewed in the same direction and ANOVA tends to be robust to violations of normality (Kenny & Judd, 1986), no variable transformations were conducted. The assumption of sphericity was met for nightmare distress, but was not met for nightmare frequency, thus the Greenhouse-Geisser correction was applied. Examination of data point availability yielded several missing-at-random cases across both nightmare distress and nightmare frequency outcome variables for a total of six participants at various time points; two participants were missing data at two time points each. As both variables were collected via the TRNS, if a participant was missing data for a timepoint, then they had missing data for both nightmare distress and nightmare frequency. One participant was missing data at baseline. Across sessions one through five, three participants had missing data at one timepoint; one participant was missing data at two timepoints. At post-treatment, two participants were missing data. As the sample size of the study was small, it was decided to retain these missing cases in the final dataset in order to optimize power of the longitudinal analysis (e.g., Rubin, 1976). Simple mean imputations were utilized to replace the missing data in the column means of complete cases for each time point for both nightmare distress and nightmare frequency (Dziura et al., 2013).

Two repeated measures ANOVAs with Helmert's contrasts were conducted using SPSS statistics package version 22.0. The within subjects factor was seven time points (baseline assessment, five therapy sessions, and one post-treatment assessment). The dependent variables were nightmare distress and frequency. Helmert's contrasts were used to examine improvement over time by comparing the mean of each variable at each progressive time point to the mean of the subsequent time points. Level 1 compared the baseline with the mean of five treatment sessions and the post-treatment, level 2 compared session 1 of treatment to the mean of the remaining four sessions and post-treatment, and level 3 compared session treatment scores to the remaining sessions plus post-treatment, and so on, until level 6 which compared the last treatment session with the post-treatment. Visual inspection of graphs and examination of which dependent variable (nightmare distress or frequency) had statistically significant improvement first in therapy tested the hypothesis that distress would mitigate before frequency.

## 3. Results

At the baseline assessment, mean frequency of nights with nightmares in the past week was 2.31 nightmares per night ($SD$ = 1.45) as compared to the mean frequency of nightmares at post-treatment ($M$ = 0.67 nightmares per night, SD = 0.98). At baseline, the participants reported an average nightmare distress of $M$ = 5.18 ($SD$ = 2.27) on the 0 to 12 scale. At post-treatment, the mean nightmare distress was reduced ($M$ = 2.33, $SD$ = 1.64). The omnibus ANOVA found a statistically significant effect of time for nightmare distress across treatment sessions, $F(6, 96) = 12.70$, $MSE = 2.45$, $p < .001$, $\eta^2 = .44$. There was also a statistically significant decline in nightmare frequency over time, $F(3.14, 57.26) = 6.07$, $MSE = 1.96$, $p = .001$, $\varepsilon = .52$, $\eta^2 = .28$ (see Figures 1 and 2). These findings indicate that the nightmare treatment significantly reduced both nightmare distress and nightmare frequency from baseline to post-treatment.

### 3.1. Nightmare Distress Analyses

The 1st level Helmert's contrast was not statistically significant, indicating that there was not a substantial change in nightmare distress from at the baseline compared to the mean of the other timepoints. Helmert's contrasts were statistically significant for nightmare distress at levels 2, 3, 4, and 5. For level 2, $F(1, 16) = 38.75$, $p < .001$, $\eta^2 = .71$, level 3, $F(1, 16) = 29.92$, $p < .001$, $\eta^2 = .65$, level 4, $F(1, 16) = 28.33$, $p < .001$, $\eta^2 = .64$, and level 5, $F(1, 16) = 8.60$, $p = .01$, $\eta^2 = .35$. This indicates that participants' nightmare distress improved from session two through five. The Helmert's contrast at level 6 was not statistically significant suggesting that there were no significant reductions in nightmare distress from session five to post-treatment.

### 3.2. Nightmare Frequency Analyses

Helmert's contrasts were statistically significant for nightmare frequency at levels 1, 2, and 3; however, levels

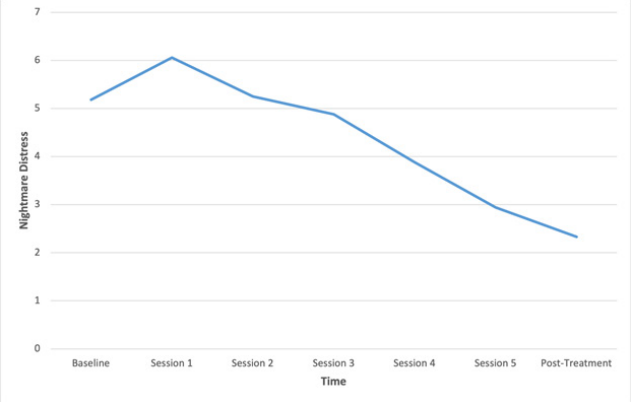


*Figure 1*. Nightmare Distress Scores Across Treatments.

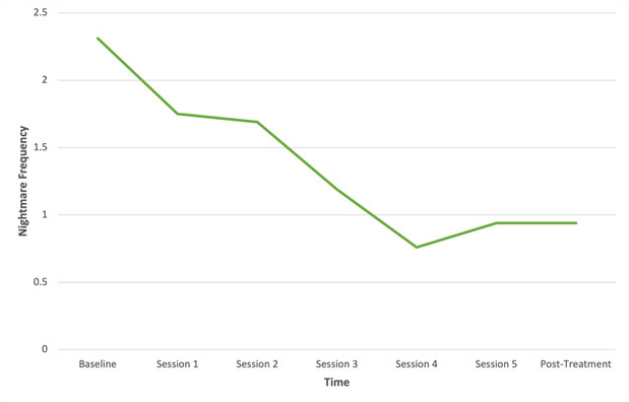


*Figure 2*. Nightmare Frequency Scores Across Treatment.

4, 5 and 6 were not statistically significant. For level 1, $F(1,16)=8.52, p=.01, \eta^2=.35$, level 2, $F(1,16)=5.40, p=.034$, $\eta^2$ = .25, and level 3, $F(1, 16)$ = 13.93, $p$ = .002, $\eta^2$ = .47. These findings indicate that participants' nightmare frequency improved from baseline through session two, but from session three to the post-treatment, on average, nightmare frequency did not significantly change. The means and standard deviations of nightmare distress and frequency at each time point are presented in Table 1.

## 4. Discussion

Current theory suggests that nightmare distress is responsible for the maintenance and continuation of pathological and chronic nightmares (Davis, 2008; Levin & Nielsen, 2007), implying that nightmare distress drives nightmare persistence. No study had tested this theory with children. We examined nightmare distress and frequency weekly, over the course of a five-session treatment, examining changes in both nightmare characteristics over seven total timepoints. We hypothesized that nightmare distress would decrease earlier in the seven time point sequence than would frequency. In other words, if distress contributed to nightmare persistence, we expected that a reduction in nightmare frequency would follow.

Many studies have evaluated the effect of nightmare treatments on both distress and frequency. In the current study, both nightmare distress and nightmare frequency significantly improved with the nightmare treatment indicated by the large effect size of time for both variables, which is consistent with findings from similar nightmare treatment studies (Davis & Wright, 2007; Cromer et al., 2022; Fernandez et al., 2013). However, the hypothesis that nightmare distress would decrease before nightmare frequency was not supported. Over the course of the five treatment sessions, nightmare frequency saw a decline in the first, second, and third treatment sessions, whereas distress increased prior to treatment session one then had a steady decline across each of the five treatment sessions through to the post-treatment assessment.

Rousseau and Belleville (2018) asserted that the primary mechanism by which nightmare treatments improve nightmare severity is the emotional processing of the nightmare content, which decreases the nightmare distress. When examining the means of nightmare distress more closely, nightmare distress demonstrated an initial increase from the baseline assessment to the first treatment session. Distress may have increased at first due to the anticipatory distress and activation of the fear network that occurs with the onset of treatment (e.g., talking more about the nightmares, having to think about the nightmares every day due to daily sleep diaries; Foa & Kozak, 1986).

Although the study's findings do not support the hypothesis that nightmare distress decreases before nightmare frequency, there are relevant theoretical considerations. It was thought that because nightmare distress maintains the cycle, if distress reduces, then frequency of the nightmares would decrease as well. Rousseau and Belleville (2018) identified several possible mechanisms of change in nightmare treatment, and they noted that self-efficacy, or the ability to control nightmares, was a possible mechanism. The current study supports this notion of controllability contributing to the nightmare cycle being broken. Possibly, the start of a negative nightmare cycle (occurrence of nightmares) may be solved by the start of a new cycle, decline of nightmares, resulting in new alternative learning. Rousseau and Belleville (2018) and Davis (2008) have suggested that several different mechanisms may act in concert to treat nightmares. The steady decline of nightmare frequency and distress over time supports the idea that nightmare treatment is not about an on-off switch of sorts but rather a process by which different skills that address efficacy, hope, relaxation, and sleep skills, in addition to the emotion processing of a nightmare through exposure and rescription, may be important in nightmare treatments. Dismantling studies will need

*Table 1*. Means and Standard Deviations of Nightmare Distress and Nightmare Frequency.

| | Nightmare Distress | | Nightmare Frequency | |
|---|---|---|---|---|
| Time Point | M | SD | M | SD |
| Baseline | 5.18 | 2.27 | 2.31 | 1.45 |
| Session 1 | 6.06 | 1.60 | 1.75 | 1.30 |
| Session 2 | 5.25 | 1.64 | 1.69 | 0.92 |
| Session 3 | 4.88 | 2.06 | 1.19 | 0.88 |
| Session 4 | 3.88 | 2.29 | 0.76 | 0.90 |
| Session 5 | 2.94 | 2.08 | 0.94 | 0.90 |
| Post-Treatment | 2.33 | 1.64 | 0.94 | 0.67 |

to be done in order to determine if any single or combination of these components cause the positive treatment effects.

This study was the first to examine the progression of change in both nightmare distress and nightmare frequency throughout a nightmare treatment in children. The findings are promising and suggest considerations for treatment of children with nightmares. One consideration may be that, while a child may report continued heightened distress in the early stages of treatment, it may be possible to achieve a clinically significant reduction of the nightmare frequency during this time. Highlighting a reduction in the child's frequency of nightmares early on may further help to instill hope and enhance self-efficacy throughout the treatment. As treatment progresses, significant reductions in nightmare distress occur, which may further disrupt the nightmare cycle.

## 5. Limitations and Future Research

This study had a small sample size and was not controlled, thus the inferences made should be interpreted with caution. A limitation of this study was that distress and frequency were collected by self-report and were retrospective data. Possibly, using actigraphy data could capture differences that were missed in self report. Additionally, mechanisms of change were not measured, and thus remain theoretical at this time. The larger study included daily sleep diaries that could have better captured both nightmare distress and frequency; however, there was a substantial amount of missing data, thus the current measures of both variables were utilized instead, which had less missing data. Although we used a statistically acceptable method of replacing missing data, there is always a risk of any method of data replacement or deletion to result in biased data. Although daily diaries are considered the gold standard for self-report sleep measurement, they are at higher risk of being incomplete due to the increased burdens parents experience and difficulties with adherence to completion (Galland et al., 2014). Although we were interested in comparing whether nightmare frequency or distress changed first, there was no way to directly compare the two dependent variables with Bayesian statistics. In future, we hope to develop a measure or method that could capture the contiguity of change so that, beyond visual inspection and beyond comparing when statistically significant change in distress and frequency occurred, we would be able to assess the order of change for statistical significance.

## 6. Conclusions

Contrary to the proposed hypothesis that nightmare distress would mitigate before nightmare frequency, the results of this study demonstrate statistically significant changes in nightmare frequency preceding improvements in nightmare distress. Although, by session five, children continued to report an average of almost one nightmare per week, nightmare distress continued to decrease. This study demonstrates that more information is needed about the relationship between nightmare frequency and nightmare distress. Understanding the relationship between frequency and distress may elucidate more effective treatment targets priorities.

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