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CHILDHOOD TRAUMA-RELATED NIGHTMARES:  
THE RELATIONSHIP BETWEEN EXPOSURE, RELAXATION, AND  
RESCRIPTING THERAPY ON COGNITIVE FUNCTIONING

By

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Professional Paper

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Childhood Trauma-Related Nightmares:

The Impact of Exposure, Relaxation, and Rescripting Therapy on Cognitive Functions

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Trauma experiences are, unfortunately, a common part of childhood in the United States and are connected to serious health-related concerns throughout childhood and adulthood. A primary symptom of trauma exposure and posttraumatic stress is re-experiencing, which often occurs in the form of nightmares. Though cognitive behavioral treatment (CBT) is currently the most well supported treatment model for trauma-exposure, it does not specifically address nightmares. Left untreated, trauma-related nightmares may become chronic, impairing quality and quantity of sleep, and exacerbating and perpetuating trauma symptoms. Quality sleep is a necessary element of healthy child development. Trauma experiences and inadequate sleep have been shown to negatively impact children's cognitive functions, including memory, attention, and learning, as well as increase behavioral problems and decrease academic performance. While PTSD treatment does not typically alleviate nightmares, both Imagery Rehearsal Therapy (IRT) and Exposure, Relaxation, and Rescripting Therapy (ERRT) have been shown to reduce nightmares, improve sleep quality, and relieve PTSD symptoms within adult samples. The proposed study found limited support that an ERRT adaptation for children aged 8- to 13-years-old (ERRT-C) was related to improvement in some cognitive functioning (e.g., attention, short-term memory, processing speed, reading achievement and comprehension).

## **Introduction**

Trauma in childhood is a significant public health concern in the United States; there are estimated to be more than 3 million reported cases of child abuse or neglect annually (van der Kolk, 2005). This takes only a portion of lifetime trauma into account. In a general population sample of children and adolescents, Costello, Erkanli, Fairbank, and Angold (2002) found that one in four had experienced at least one high magnitude stressor (such as the death of a caregiver) in their lifetime. Over half (57%) reported experiencing various other significant life stressors. In a nationally representative sample, estimating rates of victimization in youth aged 2 to 17 years old, only 29% had experienced no victimization, concluding that childhood exposure to violence, crime, maltreatment, and other forms of victimization are a “routine part of ordinary childhood in the United States” (Finkelhor, Ormrod, Turner, & Hamby, 2005; p.18).

In addition to causing a host of issues in childhood, exposure to trauma during developmental years often considerably and negatively impacts the individual in adulthood as well. The Centers for Disease Control and Prevention (CDC) reported information about adverse childhood experiences collected from approximately 9,000 adult health maintenance organization (HMO) members (Felitti, et al., 1998). Over 30% of participants reported being physically abused, 23.5% reported being exposed to family alcohol abuse, 19.9% reported being sexually abused, 18.8% reported experiencing mental illness in their family, 12.5% reported witnessing interparental violence, 11% reported emotional abuse as a child, and almost 5% of participants reported having experienced family drug abuse. The authors drew connections between these experiences and depression, suicidality, domestic violence, alcohol and drug abuse, sexual promiscuity and sexually transmitted diseases, as well as other serious health-related concerns in adulthood. Further, the more cumulative and stressful the reported

experiences, the more likely individuals were to develop health problems later in life such as cancer, stroke, heart disease, and diabetes.

The development of posttraumatic stress disorder (PTSD) is one of the most common psychological sequelae of trauma in adults (Copeland, Gordon, Angold, & Costello, 2007; Feeny, Foa, Treadwell, & March, 2004). A clinical diagnosis of PTSD includes six criteria: exposure to a traumatic event, re-experiencing the event, avoidance of the trauma-related stimuli, prolonged physiological hyperarousal, functional impairment due to these symptoms, and symptom duration of longer than one month (American Psychiatric Association [APA], 2000, 2013). Re-experiencing symptoms of PTSD may include disturbing, intrusive thoughts and nightmares; hyperarousal may include disruptive hypervigilance and a decrease in sleep quality. Sleep disturbance may contribute to changes in physiological and psychological functioning, which in turn may lead to fatigue and cognitive dysfunction (Caldwell & Redeker, 2005). Individuals who develop PTSD following trauma have an even greater risk of developing life course impairments, including major depression, substance dependence, unemployment, and marital instability (Breslau, Davis, Peterson, & Schultz, 2000). Lifetime prevalence rate estimates for adults with PTSD range from 6.8% (Kessler, et al., 2005) to 25% (Hidalgo & Davidson, 2000).

Childhood PTSD is less commonly diagnosed (Feeny, et al., 2004; Yule, 2001). A general population sample of 1,420 nine, eleven, and thirteen year old children were followed annually through sixteen years of age (Copeland, et al., 2007). Though trauma experiences were common, clinical PTSD was rarely found in this age group. According to the DSM-IV-TR, child symptoms may present differently and may include disorganized or agitated behavior, recurrent or distressing thoughts, repetitive play, nightmares, sleep disturbance, and difficulties

concentrating. Other common results of trauma in children include neurobiological impacts (Gunnar & Quevedo, 2007), impaired learning, increased sensitivity to interference, and impaired memory acquisition (Samuelson, Krueger, Burnett, & Wilson, 2010).

Although research currently fails to define the exact relationship between children's experiences of trauma and their cognitive functions, there is ample and wide-ranging support that trauma negatively impacts various aspects of learning, attention, and memory (Husain, Allwood, & Bell, 2008; Kira, Lewandowski, Somers, Yoon, & Chiodo, 2011; Saigh, et al., 2006). In a neuropsychological study of neglected and/or physically abused 6- to 12-year-old children, Nolin and Ethier (2007) found multiple cognitive deficits, including impaired attention in both groups of traumatized children when they were compared to a control group matched for age, gender, and socioeconomic status. In another study evaluating a community sample of school-aged children, those who had experienced familial trauma did not perform as well on a battery of measures evaluating memory, behavioral inhibition, processing speed, and attention as those who had experienced non-familial and no trauma (DePrince, Weinzierl, & Combs, 2009).

Following trauma, children are often troubled by repetitive and intrusive thoughts at times when they would otherwise be quiet, such as bedtime; fear of the dark and waking throughout the night are common and continue to occur outside of the typical developmental age range (Yule, 2001). Some researchers propose that nightmares and repetitive thoughts may be the best way to predict PTSD in children (Copeland, et al., 2007).

### **Sleep Disturbance**

Sleep disturbance, including nightmares, is commonly accepted as a defining characteristic of trauma exposure and PTSD and may consequently be a primary concern (Caldwell & Redeker, 2005; Davis & Wright, 2007; Rhudy, Davis, Williams, McCabe, & Byrd,

2008). Caldwell and Redeker (2005) identified common trauma-related sleep disturbances as nightmares during REM and non-REM sleep, periodic leg movement, shorter REM sleep, changes in sleep patterns, problems initiating and maintaining sleep, frequent awakening, and sleep apnea. Increased arousal symptoms, such as hypervigilance, and exaggerated startle response, commonly contribute to sleep disturbance by impeding initiation and continuity of sleep (Glod, Teicher, Hartman, & Harakal, 1997). Researchers have hypothesized that disruptions in sleep may interfere with an individual's processing and resolution of the trauma, increasing anxiety and maintaining the disorder (Koren, Arnon, Lavie, & Klein, 2002; Krakow, et al., 2001). Persistent issues involving sleep may also exacerbate behavioral issues and emotional distress (Glod, et al., 1997).

In the National Comorbidity Study (NCS), Chambers and Belicki (1998) found that individuals with life-time PTSD had high levels of nightmares and insomnia, contributing to the intensification of their PTSD symptoms. A cohort of adult survivors of childhood trauma in the NCS experienced significant nightmare frequency, narcolepsy, and sleep apnea. Furthermore, resilience from developing PTSD or other mental health diagnoses did not appear to protect these trauma survivors from sleep or dream disturbances.

Day-time thoughts about the nightmares may evoke increased physiological and emotional arousal, further preventing sleep and increasing nightmare-related distress. A circular relationship is created when poor sleep and nightmares maintain trauma symptoms. Individuals who experienced nightmares in response to trauma, scored significantly worse on self-report measures evaluating posttraumatic stress, sadness upon awakening, depression, and overall sleep quality (Langston, Davis, & Swopes, 2010). Recurrent trauma-related nightmares not only maintain distress, but may increase PTSD and trauma-related symptoms. Additionally,

posttraumatic nightmares can be extremely disruptive, with or without a diagnosis of PTSD (Davis, Byrd, Rhudy, and Wright, 2007).

Nightmare content may be closely related to the trauma itself or may be of a more general nature. Studies estimate trauma-similar nightmares in 50% to 56% of cases and exact replays of the trauma in 20.5% of cases (Davis, et al., 2007; Rhudy, et al., 2008). Compared to individuals who reported trauma-dissimilar nightmares, those who experienced nightmares associated with their trauma often expressed greater distress (Davis, et al.). Furthermore, they reported multiple nightmares in one night, multiple nights that included nightmares, less sleep per night, more depression on waking, and poor overall sleep quality. Poor sleep quality and resulting daytime sleepiness and fatigue commonly exacerbated PTSD symptoms and psychiatric distress in adults (Krakow, et al., 2001).

### **Sleep Disturbance in Children**

Sufficient and quality sleep contributes to normal growth and maturation processes, and is essential to healthy physical and psychological development (Caldwell & Redeker, 2005). Gregory and O'Connor (2002) conducted a longitudinal study evaluating the relationship between sleep problems and behavioral issues in children 4 to 15 years old. Sleep problems in children as young as four years of age, were found to negatively impact daytime mood, concentration, attention, problem solving, hyperactivity, depression, and anxiety. These difficulties then contributed to problems with academic learning, family and peer relationships, and the child's ability to manage feelings of aggression. Further, a meta-analysis was conducted to determine if insufficient sleep is as clearly related to cognitive performance and behavioral problems in children as it has been found to be in adults (Astill, Van der Heijden, Van Uzendoorn, & Van Someren, 2012). The study evaluated the relationship in 35,936 healthy



school-age children (5 to 12 years old) in 86 studies. In the authors' review of literature, they found that children with sleep disorders, those denied sleep in experiments, and those described as "short sleepers" have been found to have cognitive and behavioral impairments. Sleep significantly impacts brain activity and is considered necessary for optimal cognitive functioning. The authors concluded that children's insufficient sleep is associated with deficits in cognitive functions, decreases in school performance, and increases in behavioral problems. Cognitive impairments specifically named included executive and multiple-domain functioning. The strongest association with lack of sleep was found with decreased school performance. Additionally, both internalizing and externalizing behavioral problems were indicated.

Nightmares are typically found to occur throughout childhood and adolescence as a normal part of development. The highest occurrence rates are between the ages of five and ten. Langston, et al. (2010) delineated a distinct difference between idiopathic and posttraumatic nightmares in children. A natural, gradual decrease in frequency of idiopathic nightmares takes place beginning at about the age of ten, suggesting a developmental course. Frequent nightmares (occurring at least every week) have been found to occur at a rate of about 3.5% in the general population (Schredl, Fricke-Oerkermann, Mitschke, Wiater, & Lehmkuhl, 2009). In trauma-exposed children, this rate is much higher, with 50% or greater experiencing frequent nightmares (Langston, et al.).

'Chronic' nightmares suggest that they occur in a considerably stable manner over time. In a longitudinal study analyzing stability of nightmares and their emotional impact on children, nightmare occurrence was predicted by emotional symptoms and number of nightmares the previous year (Schredl, et al., 2009). More pathological symptoms were found in children whose self-reports and parental estimates described their nightmare experiences as 'chronic' when

compared to those who either did not have nightmares or had idiopathic nightmares. Symptoms included emotional difficulties, hyperactivity, inattention, conduct problems, and problems with peer relations. The authors reported greater risk of psychiatric diagnosis when nightmares continue into adulthood, conveying the critical need to consider nightmare occurrence in children.

### **Treatment for Individuals Exposed to Trauma**

Though there is strong, but relatively minimal, research conducted on interventions with children suffering from trauma exposure and PTSD, a significant amount of research supports cognitive behavioral treatment (CBT) for adults diagnosed with PTSD. The International Society for Traumatic Stress Studies (ISTSS) task force rated CBT for adults as a Level A treatment (Foa, Keane, & Friedman, 2000). CBT focuses on assisting the individual in making sense of the traumatic experience by understanding their thoughts, behaviors, and emotions in relation to the trauma. Trauma-focused CBT (TF-CBT; Cohen, 2003) combines traditional CBT for trauma with conjoint parent-child treatment sessions and parent management modules. The key to the exposure component of CBT is believed to be the element of conditioning. In both imaginal exposure (i.e., rehearsal of the traumatic memory) and in vivo exposure (i.e., confrontation with trauma stimuli), the individual's stress related to the trauma is gradually decreased as the client experiences habituation and learns to face the anxiety caused by traumatic memories in a safe and supportive environment.

A review performed on thirteen CBT studies conducted with children, between 1986 and 2004, supported CBT as a promising treatment for this population (Feeny, et al., 2004).

Deblinger, Steer, and Lippman (1996) conducted a study of CBT treatment with 100 sexually abused seven to thirteen-year-olds, of whom 71% met criteria for clinically diagnosed PTSD.

Eighty-four percent of children that directly participated in CBT showed greater decreases in symptoms, compared to 70% of children in parent-only or standard community conditions. A follow-up study conducted with these children two years later indicated that decreases in symptoms were maintained (Deblinger, Steer, & Lippmann, 1999). March, Amaya-Jackson, Murray, & Shulte (1998) conducted a single case design study in a school setting, with fourteen 10 to 15 year olds completing group sessions of TF-CBT. At post-treatment follow-up, 57% no longer met diagnostic criteria for PTSD and 86% were diagnosis free at 6-month follow-up. Not only do children typically experience significant improvements from TF-CBT treatment relating to PTSD symptoms, they also report lower depression scores, greater social competence, and fewer behavioral problems (Cohen, 2003; Feeny, et al., 2004).

Common elements of the TF-CBT interventions conducted in youth populations include teaching emotion identification, stress management coping techniques and affect modulation, psychoeducation related to the traumatic event(s), exposure (typically including a trauma narrative), and cognitive processing. Many include a parental component (Cohen, 2003) with emphasis on parent management techniques for disruptive behavior, as well as joint parent-child sessions in which the child shares their trauma narrative. Although TF-CBT specifically targets PTSD in youth and may reduce many of its symptoms, chronic nightmares and related sleep disturbance have been found to be exceedingly resistant to similar PTSD treatments in adults, underscoring the need for nightmare-specific interventions (Davis, et al., 2007; Forbes, et al., 2003; Krakow, et al., 2001).

### **Treatment for Trauma-Related Nightmares in Adults**

Front-line methods of treating PTSD, including CBT and exposure techniques, are not commonly conducted with nightmare content (Davis & Wright, 2007). One treatment approach,

Imagery Rehearsal Therapy (IRT; Krakow, et al., 2001), was developed to specifically address nightmare symptoms within the “vulnerable psychophysiological system” of sleep in order to “facilitate, enhance, or maximize therapeutic outcomes” (p. 542). IRT is a manualized treatment that includes: nightmare education, training of pleasant imagery techniques and other CBT coping skills (e.g., thought stopping, breathing techniques), as well as instruction on the application of imagery-rehearsal to specific nightmares. IRT has been shown to not only reduce nightmares and improve quality of sleep, but also to decrease PTSD symptom severity (Casement & Swanson, 2012).

In 2003, Davis modified previously applied versions of IRT by adding behavioral modification techniques to improve sleep habits, the identification of trauma-related themes within the nightmares, and a more intensive exposure element. Davis’ version, Exposure, Relaxation, and Rescripting Therapy (ERRT), includes identification of trauma themes within the nightmares, as well as psychoeducation and exposure components relating to the trauma itself. Additionally, clients are trained in CBT relaxation techniques, such as diaphragmatic breathing and progressive muscle relaxation.

The focus of ERRT is three-fold; it addresses anxiety within the individual’s physiological (e.g., addressing increased arousal at bedtime), behavioral (e.g., substances are eliminated that may have been used as sleep aids), and cognitive response systems (e.g., belief that a nightmare will occur once asleep; Davis & Wright, 2005). Exposure is intended to provide a safe and supportive environment for the individual to face their fears and become habituated to the anxiety they caused.

Davis and Wright (2007) conducted a randomized clinical trial of ERRT in which 78.9% of individuals who completed treatment reported no nightmares during the month prior to their

last follow-up assessment. Approximately eighty-four percent reported no nightmares in the week prior to their last follow-up. ERRT demonstrated efficacy in reduction of chronic nightmares and psychiatric distress, while improving sleep quantity and quality. Treatment gains were maintained at six month follow-up. ERRT has also been effective in decreasing the frequency and intensity of PTSD, depressive, and panic symptoms, contributing to growing empirical evidence in support of this model (Davis & Wright, 2005). Further, ERRT resulted in significant reductions of physiological (e.g., heart rate, skin conductivity) and subjective emotional reactions (e.g., fear, sadness) to personal nightmare-related imagery in a community sample of chronic trauma-related nightmare sufferers (Rhudy, et al., 2010).

### **Treatment for Trauma-Related Nightmares in Youth**

In a thorough search of the literature, two randomized clinical trials and two case studies were identified that applied exposure-based treatment to nightmares in child populations. St-Onge, Mercier, and De Koninck (2009) evaluated IRT with twenty 9- to 11-year-olds experiencing frequent nightmares (one or more per week for six months). The children did not have PTSD diagnoses. Following a course of IRT, overall, nightmares were significantly reduced and most participants reported no nightmares by the second month of treatment. Treatment gains were maintained at a nine-month follow-up. Simard and Nielsen (2009) investigated IRT with seventeen 6- to 11-year-olds experiencing one or more nightmares per week (minimum number of weeks was not reported). The children were not required to have experienced trauma and the study did not mention PTSD. All participants were included in the first treatment session that covered nightmare education, after which children were randomly assigned to the treatment group or the wait-list control group. Overall nightmare distress was

significantly reduced for the treatment group following the third session; however, low recruitment seems to have interfered with this study's design and may have complicated results.

One of the case studies included administration of IRT to a 10-year-old boy who had experienced physical, sexual, and emotional abuse, and five foster placements (Peirce, 2006). At the time of treatment, the child had been moved to a therapeutic facility. He had been diagnosed with autism, psychotic disorder (NOS), and mild to moderate mental retardation. At the beginning of treatment the child's global assessment of functioning (GAF) was determined to be twenty-five. He had experienced nightmares every night for more than a year. After five sessions within a four-week period, the child reported experiencing one nightmare approximately every two-weeks. His GAF was reassessed at 70. The child's success, although an individual case study, lends anecdotal support for the application of IRT to a specialized child population.

The only study to date that has adapted ERRT to a child sample was a case series with an 8-year-old and an 11-year-old who had experienced trauma and who suffered with chronic nightmares (Fernandez, et al., 2013). The ERRT model included four treatment sessions and evaluated nightmare frequency, severity, and distress. Although both children continued to experience nightmare related distress, the 8-year-old experienced a decrease in number of nightmares per week, nights with nightmares, and nightmare severity. A possible secondary effect worth noting is that this child also experienced a reduction of externalizing and overall behavior problems post-treatment. The 11-year-old did not experience significant changes in nightmares during treatment. The researchers hypothesized that the child's rescription was too similar to the actual trauma and that practice was causing more distress. The therapist assisted the child in creating a new rescription, resulting in a striking decrease in nightmares at the post-treatment follow-up. Both children experienced fewer overall sleep disturbances following

completion of treatment. This study provides supportive preliminary data for the child adaptation of ERRT, as well as valuable considerations for treatment implementation.

Aside from these studies, research is lacking in the evaluation of the impact of childhood trauma on sleep disturbance, daytime functioning, cognitive performance, affect regulation, physical health, and overall life quality (Caldwell & Redeker, 2005). Given the critical role sleep plays in the relationship between PTSD symptoms and long-term physical and emotional health, additional research is essential to evaluate interventions for this developing and vulnerable population. Early intervention would be an important development in reducing or eliminating sleep disturbance that could become more resistant to treatment in adulthood. St-Onge, et al. (2009) suggested that lifelong adult nightmare sufferers have many years to develop inaccurate cognitions and maladaptive behavior patterns associated with their condition. Children may be better candidates for treatment simply because less time has passed, prohibiting their condition from becoming chronic. Furthermore, treatment at a young age would ideally prevent these children from years of suffering with nightmares and from developing associated pathologies.

## **Hypotheses**

Although current research fails to identify the specific relationship between trauma, cognitive functions, and sleep deficits, the relationship between trauma and learning, attention, and memory is supported (Husain, et al., 2008; Kira, et al., 2011; Saigh, et al., 2006). Additionally, as previously mentioned, an 86-study meta-analysis on sleep, cognition, and behavioral problems in healthy school-aged children concluded that insufficient sleep is associated with deficits in cognitive functions and decreases in school performance (Astill, et al., 2012). Further, sleep disturbance, including nightmares, is accepted as a defining characteristic

of trauma symptomology; children often experience disturbed sleep in response to trauma exposure. Based on these supported relationships, the current study will evaluate the impact of trauma nightmare treatment completion on children's cognitive abilities by assessing attention, short-term memory, processing speed, concentration, reading achievement and comprehension, and academic achievement.

The specific aims for the present study are: (1) to assess if the attention, short-term memory, and processing speed, as measured by the Letter-Number Sequencing subtest of the Wechsler Intelligence Scale for Children, Fourth Edition (WISC-IV; Wechsler, 2003), of 8- to 13-year-old children who have experienced trauma and are currently suffering from frequent nightmares will improve from pre- to post-treatment with successful completion of ERRT-C; (2) to assess if the short-term memory, attention, and concentration, as measured by the Digit Span subtest of the WISC-IV (Wechsler), of 8- to 13-year-old children who have experienced trauma and frequent nightmares will improve from pre- to post-treatment with successful completion of ERRT-C; (3) to assess if reading achievement and comprehension, as measured by the Reading Curriculum-Based Measurement (R-CBM) and the Standard Reading Comprehension Assessment Passages (MAZE) subtests of the Aimsweb Measurement System (Shinn & Shinn, 2002a, b), of 8- to 13-year-old children who have experienced trauma and frequent nightmares will improve from pre- to post-treatment with successful completion of ERRT-C; and (4) to determine if academic functioning, as measured by grade point average (GPA), will improve from pre- to post-treatment.

It is expected that successful completion of ERRT-C will improve attention, short-term memory, processing speed, concentration, reading achievement and comprehension, and academic performance. Participants who have experienced trauma and suffer from frequent



nightmares, will perform better on a measure of attention, short-term memory, and processing speed upon successful completion of ERRT-C (hypothesis 1) and on a measure of short-term memory, attention, and concentration (hypothesis 2). It is also expected that participants will perform better on measures of reading achievement and comprehension (hypothesis 3) and that their academic achievement will improve (hypothesis 4).

## **Method**

### **Participants**

Participants for the current study included children, aged 8 to 13 years, and their parents/legal guardians who were recruited for a pilot clinical effectiveness study of the ERRT-C protocol for trauma-related nightmares. Participants experienced a traumatic event, as defined by the Diagnostic and Statistical Manual, 5<sup>th</sup> edition (DSM-5; APA, 2013), no less than 1 month prior to the initial assessment and nightmares once per week or more for at least 1 month. The nightmare criterion of 1 month was selected in order to be in accordance with PTSD criteria, so as to not interfere with typical recovery processes from traumatic events (APA). Inclusion criteria, established via a phone screen, included having a parent or legal guardian who was able to participate. Both the parent/guardian and child needed to be able to read and speak English.

Exclusion criteria included having a diagnosis of pervasive developmental disorder, mental retardation, or apparent psychosis, assessed by caregiver-report or established during the initial assessment. There were no restrictions on gender, race, or ethnic background.

Participants were not excluded on the basis of taking particular medications, as long as they had been stable on the medications for longer than one month and agreed to remain stable on the medications throughout the treatment.

Two participants – both 9 year old males and their female caregivers – were recruited to participate in the study. Participant 1 (pseudonym – Elliott) learned about the study via a flyer posted in the community. Participant 2 (pseudonym – Joshua) learned about the study via his outpatient therapist, who had read about it in a story published in the local newspaper.

Demographic information for both participants is provided in Table 1.

## **Measures**

The current study was a secondary project evaluating cognitive abilities as part of a larger primary research project. Assessments of the primary study, which evaluated the overall effectiveness of ERRT-C, covered five primary domains: background and demographic information; trauma exposure and mental health status, including PTSD, anxiety, and depressive symptoms; nightmare impact and content; sleep quality; and quality of life. All self-report and interview measures were administered during the initial evaluation, post-treatment, and at 3- and 6-month follow-ups. In addition, participants kept a daily diary of sleep quality throughout the study.

**Child and Caregiver Demographic Form.** The Child and Caregiver Demographic Form was given only at pre-treatment (see Appendix A). The child’s age, grade, ethnicity, and gender were queried, as well as the caregiver’s ethnicity, marital status, income, education, occupation, and relationship to the child.

**Trauma-Related Nightmare Survey – Child Version.** The Trauma-Related Nightmare Survey – Child Version (TRNS-C; Langston, 2007) is a 14-item self-report measure that assesses current sleep quality, frequency, severity, and duration of nightmares, as well as cognitions, emotions, and behaviors related to nightmares in children (see Appendix B). Although psychometric data are not yet developed for the TRNS-C, the adult version (TRNS) exhibited

adequate test-retest reliability for frequency of nightmares ( $r = .64$ ; Davis & Wright, 2007). Convergent validity was also found with daily behavioral records of sleep/nightmares: nights with nightmares ( $r = 0.82$ ) and number of nightmares ( $r = 0.81$ ). Further, the authors of the development case series of ERRT-C reported that children often have the ability to comprehend and report on number concepts; however, they may lack precision in these reports (Fernandez et al., 2013). For this reason, they suggest interpreting children's self-reported nightmare frequency from an internally consistent context. They also explain that children are reliable at "larger than" and "smaller than" discriminations, and are most often consistent and accurate reporters of these magnitude changes. Thus, in line with this strategy, the TRNS-C results will be interpreted as a within-subject variable over time per participant.

**Nightmare Distress Questionnaire – Modified.** The Nightmare Distress Questionnaire – Modified (NDQ; Belicki, 1992) is a 13-item self-report measure of nightmare related distress (see Appendix C). Items are rated on a 5-point scale from *never* (0) to *always* (4), except for 3 items for which the alternative responses vary (e.g., *not at all*, *a great deal*). Clinical significance is indicated by a score above 21. Higher scores are significantly related to interest in therapy for nightmares. Internal consistency of the measure has been reported at 0.88 by the author. The language of the original measure was modified for children.

**Revised Child Anxiety and Depression Scale.** The Revised Child Anxiety and Depression Scale (RCADS; Chorpita, Yim, Moffitt, Umemoto, & Francis, 2000) is a 47-item self-report measure that corresponds to the DSM-IV anxiety disorders, with scales corresponding to separation anxiety disorder, social phobia, generalized anxiety disorder, panic disorder, obsessive compulsive disorder, and major depressive disorder (see Appendix D). The current study used the RCADS total anxiety score and depression subscale score to assess symptoms of

anxiety and depression often associated with sleep problems. It requires participants to rate how often each item applies to them. Items are scored *never* (0), *sometimes* (1), *often* (2), and *always* (3). Higher scores indicate more severe symptoms and T-scores > 65 are considered clinically significant. Chorpita, et al. evaluated psychometric properties of the measure with 246 children and adolescents from public and private schools on O’ahu, Hawaii. Test-retest reliability was favorable with alpha coefficients of  $\alpha = 0.80$  for the generalized anxiety subscale and  $\alpha = 0.76$  for the major depressive subscale. Convergent validity correlations with the Revised Children’s Manifest Anxiety Scale (Reynolds & Richmond, 1978) total scores ranged from 0.63 to 0.74.

**Letter-Number Sequencing.** The Letter-Number Sequencing subtest of the WISC-IV (Wechsler, 2003) was used as a measure of attention, short-term memory, and processing speed (see Appendix E). The subtest required the child participant to listen to a sequence of letters and numbers and then process, recall, repeat, and manipulate these letters and numbers. The WISC IV normative sample was based on 2,200 children (aged 6 to 16) from 11 different age groups (each one year wide), with equal numbers of males and females per group (Williams, Weiss, & Rolfhus, 2003). Ethnicity was matched with the March 2000 US Census data. WISC-IV Letter Number Sequencing subtest split-half reliability coefficients across all age groups in the normative sample were very good and averaged 0.90 (Wechsler).

**Digit Span.** The Digit Span subtest of the WISC-IV (Wechsler, 2003) was used as a measure of short-term memory, attention, and concentration (see Appendix F). The child participant was asked to repeat numbers in the same order as read aloud by the examiner and in the reverse order of that presented by the examiner. WISC-IV Digit Span subtest split-half reliability coefficients averaged across all age groups in the normative sample were high at 0.87 (Wechsler).

If the WISC-IV (Wechsler, 2003) had been administered in its entirety, to determine a participant's overall general intellectual ability, the Letter-Number Sequencing and Digit Span subtests would be computed together to create the Working Memory Index (one of four indices corresponding to individual cognitive domains that together create a full scale intelligence score). The composite scores, percentile ranks, and confidence intervals will be presented for the Working Memory Index scores in order to illustrate context for improvements and declines in functioning.

**Reading Curriculum-Based Measurement.** The Reading Curriculum Based Measurement (R-CBM) subtest of the Aimsweb Measurement System (Shinn & Shinn, 2002a) was used as a measure of the child's oral reading skill and speed (see Appendix G). This measure was designed to assess general reading achievement, and comprehension. For each administration of an R-CBM probe, the child read a passage from a printed page aloud for one minute. Words that were mispronounced, substituted, omitted, or read out of sequence, that the child did not self-correct within three seconds were recorded as errors. Aimsweb R-CBM assessments are research-based and meet professional standards for reliability validity, and sensitivity to improvement. Aimsweb benchmark reading assessments have been found to have high correlations of reading difficulty level, ranging from 0.83 to 0.97, with a median of 0.95 (Howe & Shinn, 2002). In addition, alternate-form reliability ranges from 0.80 to 0.90, thereby meeting technical adequacy (Howe & Shinn).

**Standard Reading Comprehension Assessment Passages.** The Standard Reading Comprehension Assessment Passages (MAZE-CBM) subtest of the Aimsweb Measurement System (Shinn & Shinn, 2002b) was used in conjunction with the R-CBM, as a supplemental measure, to provide a more complete picture of the child's general reading skill and speed (see

Appendix H). This measure was designed to corroborate the general reading achievement, and comprehension score of the R-CBM. The MAZE probe is a multiple-choice cloze task that the child read silently. The first sentence of a 150-400 word passage was left intact. Thereafter, every seventh word was replaced with three words inside parentheses and the child chose the word that correctly completed the sentence.

**Academic Performance.** Academic performance was measured by grade point average (GPA). GPA was collected from the participating parent/legal guardian or authorized school official, with parental/legal guardian consent.

## **Treatment**

**Exposure, Rescripting, and Relaxation Treatment - Child Version.** Exposure, Rescripting, and Relaxation Treatment – Child Version (ERRT-C; unpublished manual) was conducted as approximately two-hour sessions, once a week for five or six consecutive weeks. Treatment was provided by the Principal Investigator, her doctoral advisor (Stanick), and trained, psychology doctoral students.

The focus of session one was psychoeducation and investment in treatment. A critical aspect of treatment included the child and parent engagement. Session one educated the family about expectations for treatment, de-stigmatized “therapy,” and validated them for being proactive by seeking treatment. It also provided the family with vocabulary and insight for detecting treatment gains. Specifically, the child was taught to identify feelings and symptoms that were problematic so that they were able to track these problem areas and watch them change over the course of treatment. They also previewed what to expect in the coming weeks. The routine of homework was established.

Psychoeducation was also the focus for session two. Information was provided to parents and children (in separate rooms) about trauma, nightmares, sleep habits, and guidance on how to modify poor sleep hygiene. Home applications were established in that the family identified six sleep habits to target: three helpful habits they tried (e.g., setting a consistent bed time) and three disruptive behaviors that they discontinued (e.g., permitting the child caffeine or sugar at night interferes with quality sleep). Home application was critical. The rationale was for (a) generalization of skills to the home environment, and (b) teaching the family to be proactive in the intervention. Home tools included a sleep habit log and daily monitoring of symptoms.

Sessions three through five began with a review of the home applications and symptoms of the previous week. The focus of session three was Progressive Muscle Relaxation (PMR), called 'tighten and relax each muscle' (TREM) in the manual. Part I was a psycho-educational component about physiological responses to stress and how relaxation can decrease stress. In Part II, the child learned to give subjective units of distress ratings before and after a demonstration of PMR (TREM rating). PMR was taught to child and parent at the same time. Part III set the stage for home application. A recording of PMR was given to the child at the end of this session and home use of PMR was established. Home work was set up including additional work on healthy sleep habits.

Session four's focus was exposure to the trauma nightmare. Part I began with parental psycho-education about exposure treatment. This included advising the parent of normative responses to exposure treatment, as well as teaching them how to therapeutically respond to their child during the home-based portion of exposure. Treatment during this session involved psychoeducation on the development and maintenance of nightmares related to a traumatic event and rationale and evidence for exposure treatment. Part II was the trauma-nightmare exposure

with the child (telling, drawing, or writing about the nightmare). TREM ratings were taken pre- and post-exposure in order to gauge arousal.

Following this, a cognitive and rescripting treatment was introduced. The child learned about the role of themes in their individual nightmare. The child was then taught how to change this nightmare according to one of the identified themes. Rescripting empowered the child to have mastery in the situation. A new script featured the child in control and no longer fearful. In Part III, the child read the rescripted nightmare aloud. Belly breathing was taught at the end of this session to help manage arousal. Home applications were set up with the parent and child so that the parent was able to support and appropriately respond to the child for continued practice and mastering of the new script. Parent and child manuals provided routine weekly homework of symptom tracking and the sleep log.

Relapse prevention and mastery were the focus of session five. Both child and parent were taught slowed breathing to increase the effectiveness of belly breathing. At the end of this session a review of treatment was conducted along with suggestions on how to deal with future nightmares. An informal discussion regarding ways to improve this treatment also took place with parents at the end of this session.

Treatment sessions one, two, and four were conducted by meeting with the child first, meeting with the caregiver second, and then meeting the child and caregiver together. The order in which the child and caregiver were met with was switched for session three and five.

## **Procedure**

This study was conducted in accordance with the code of conduct of the American Psychological Association and approval was obtained from the Institutional Review Board of the University of Montana prior to beginning the study. Trained, clinical psychology doctoral



graduate students and their graduate advisor served as assessors and clinicians, informed potential participants about the study, and obtained informed consent and assent. Different doctoral students served as assessor and clinician for each family, in order to avoid potential biases in assessment interpretation.

Assessments and treatment were conducted with two child-caregiver dyads. Families were recruited through advertisements for the study in the community, including flyers, announcements at mental health agencies, newspaper ads, and email announcements. Interested caregivers were administered a brief phone screen to assess their child's eligibility. Individuals who did not meet exclusionary criteria were provided information about the study and if interested, scheduled for an evaluation that included the self-report measures designed to determine their child's current symptomatology and functioning and verify their eligibility for inclusion in the study ( $N = 1$ ). Only one family who contacted the study did not meet inclusion criteria due to age (6 years old). Appropriate referrals were provided to those individuals who did not meet study criteria. Recruitment, screening, and initial evaluations have taken place throughout the study period and are on-going.

Baseline records of each participant's attention span, short-term memory, processing speed, concentration, and reading achievement and comprehension were obtained at the initial intake interview, approximately one-week prior to the start of treatment. Treatment was conducted with child-caregiver dyads and consisted of five or six sessions, conducted once a week (consecutive weeks). Following the five-week treatment phase, participants underwent re-evaluation, which consisted of re-administering all listed measures. At three- and six-months following treatment, all participants were to be again re-evaluated. The WISC-IV subtests, along with all other measures, were administered a total of four times. Treatment was provided free of

charge and participants were compensated with cash for each post-treatment and follow-up evaluation.

### **Data Analytic Plan**

While randomized controlled trials (RCTs) may generally offer greater support for causal relationships, an RCT may be premature when pilot testing novel treatment approaches. Further, despite significant recruitment efforts, only two families contacted the study, met the inclusion/exclusion criteria, and completed the treatment and assessments; thus, in response to the small number of participants recruited for this study, an A-B case study design was chosen. The A-B design is commonly used when evaluating single-case series. It allows the researcher to compare performance at baseline (Phase A) to performance post-treatment (Phase B).

Although there is debate about the consistency of interpretation of visually inspected data, there is substantial support for its appropriate and valuable application (Kahng et al., 2010). The authors point out that treatment decisions are often guided by the visual inspection of data and that context is a useful element in interpretation. The A-B case study design is presented in graphed illustrations, allowing for visual assessments of treatment effects.

## **Results**

### **Case Presentations**

**Participant 1: Elliot.** Elliot was a 9-year-old boy whose mother requested assistance for her son's nightmares, after she saw a flyer about the current research study posted in a local store window. During the initial phone screen, Elliot's mother reported that he had experienced three traumatic incidents: 1) as a toddler, he witnessed his father's violent outbursts that led to his parents' divorce, 2) he was in a vehicle accident, and 3) he had an accident at a theme park that required stitches to his face. Although Elliot was a toddler when he witnessed his father's temper outbursts, he was required by the court to visit his father in the summer prior to treatment.

Elliot's mother indicated that he did not have a good visit with his father, he came home early, and he experienced substantial emotional upset as a result. The vehicle accident Elliot experienced occurred approximately two years prior to the start of treatment. Although he was not seriously injured, his mother believed it was traumatic due to its occurrence on their first day following a move to a new city and state.

During the phone screen, Elliot's mother reported that he experienced nightmares "almost every night," that his nightmares woke him, and that his most recent nightmare was the night prior to this phone contact. She reported that Elliot was only able to remember his nightmares on occasion and therefore may not be able to report about them. She also reported that Elliot's nightmares have "always" been a concern and that he experienced night terrors when he was younger.

Elliot's pre-treatment assessment occurred during the summer between his third- and fourth-grade school years. During assessment, he required some assistance in filling out the measures. The assessor read many of the items to Elliot, others they read together. He presented as an introspective child who carefully considered each question prior to answering in a matter-of-fact manor. He became irritated when similar questions were asked multiple times in different ways, pointing out that he had already answered those items.

During questions from the Trauma-Related Nightmare Survey – Child Version (TRNS-C; Langston, 2007), when items included wording that referred to a "scary thing" that happened to Elliot and its relationship to his nightmares, he stated, "I have no scary thing." He also reported that his nightmares did not begin after something "scary" happened. Though Elliot did not appear to identify any traumatic events at the pre-treatment assessment, his mother continued to express her concern regarding his known trauma history at a young age (per her report) and

given that many individuals are not willing to discuss their trauma experiences at the start of treatment, this issue did not meet exclusion criteria, thus the decision was made to include him in the study. Elliot indicated that he had 1-2 nightmares each week (recorded as 1.5 nightmares) and that he did not have more than one bad dream each night. As Elliot progressed through treatment, the number of nights with nightmares remained at 1-2 nights at the highest, and 0 nights at the lowest. He reported 0 nights with nightmares at post-treatment and 3-month follow-up. Elliot's reported nights with nightmares and nights with more than one nightmare are graphed throughout pre-treatment, treatment, and post-treatment phases in Figures 1 and 2.

When completing pre-treatment questions from the Nightmare Distress Questionnaire (NDQ; Belicki, 1992), Elliot reported that when he has been awakened by a nightmare that it was *sometimes* hard to stop thinking about it and get it out of his head. He indicated that nightmares *sometimes* seem so real that it is hard to believe they are just dreams. When asked if he ever felt that something in his nightmare really happened, Elliot responded that this was "personal," that he did not want to talk about it, and he refused to elaborate any further. At a total score of 7, Elliot's reported nightmare-related distress at pre-treatment was not clinically significant (total score > 21). Elliot's NDQ scores ranged as high as 19 at the 3-month follow-up and as low as 2 at the 6-month follow-up, representing an overall decrease in nightmare distress. His NDQ scores are graphed throughout pre-treatment, treatment, and post-treatment phases in Figure 3.

During pre-treatment assessment of anxiety and depression with the Revised Child Anxiety and Depression Scale (RCADS; Chorpita et al., 2000), Elliot responded to items representing experiences of depression and anxiety such that he *often* felt sad or empty, was *always* bothered by bad or silly thoughts or pictures in his mind, *sometimes* had trouble sleeping, and *sometimes* felt scared to sleep on his own. On the parent version of the RCADS, Elliot's

mother reported that he *often* felt sad or empty, was *always* scared to sleep on his own, was *often* tired a lot, and *often* worried when in bed at night. Only one of Elliot's RCADS scores were clinically significant ( $> 65$ , T-score) at pre-treatment, which was the depression subscale on the parent-version of the measure. The scale ranged as high as 92 at the 6-month follow-up, and did not reduce below 75 at any of the assessment time-points, demonstrating an overall increase in Elliott's parent-reported depression. Elliot's self-report of depression decreased from pre- to post-treatment ( $T_{pre} = 44$ ;  $T_{post} = 40$ ). However, it increased from pre-treatment to 6-month follow-up ( $T = 49$ ). Despite the increase, all self-report depression scores were in the normal range at all assessment time points. Elliot's mother's report of his total anxiety score on the RCADS increased from pre- to post-treatment ( $T_{pre} = 49$ ;  $T_{post} = 54$ ), and again at 6-month follow-up ( $T_{pre} = 55$ ; the normal range at all assessment time-points). Elliot's self-report on this measure evidenced a decreased score ( $T_{pre} = 36$ ;  $T_{post} = 31$ ;  $T_{3mos} = 33$ ; normal range at all time-points). Both parent- and self-reported anxiety and depression scores on the RCADS are graphed for pre-treatment and post-treatment phases in Figure 4.

Elliot and his mother came to each assessment and treatment session as scheduled and on-time. In the first treatment session, Elliot identified three goals for his participation in ERRT-C: 1) he wanted to be a "little happier," 2) he believed he should play with Legos more and play Minecraft less, and 3) he wanted to sleep better. Elliot's mother reported that he was not on medication at pre-treatment and his medication status did not change throughout the study. With his mother's assistance, Elliot completed homework assignments for most days during each week of treatment.

**Participant 2: Joshua.** Joshua was a 9-year-old boy whose mother requested assistance for her son's nightmares, after receiving a referral to the current research study from Joshua's

therapist. During the initial phone screen, Joshua's mother reported that he had experienced two traumatic incidents: 1) a babysitter grabbed and handled him harshly, leaving bruises, and 2) his best friend died in a house fire. The experience that Joshua's mother reported as most traumatic to him was his best friend's death. During the phone screen, Joshua's mother reported that he experienced nightmares "at least five nights a week" and that his nightmares woke him. She also reported that Joshua had experienced nightmares since kindergarten, but that they had gotten progressively worse after his best friend died. Notably, although this was not relevant to any inclusion/exclusion criteria, Joshua's nightmares were more analogous to his traumatic experiences than Elliot's.

Joshua's pre-treatment assessment occurred in the middle of his fourth-grade school year. During assessment, he required assistance in filling out the measures. Given Joshua's reported learning difficulties (i.e., he had an Individualized Education Plan at school for serious emotional disturbance as well as to receive special education in reading and math), the assessor verbally asked Joshua each of the self-report questions on measures regarding his nightmares. He presented as an easily distracted child with a vivid imagination, though he appeared to carefully consider each question prior to answering. Joshua answered questions consistently and clearly.

During questions from the Trauma-Related Nightmare Survey (TRNS-C; Langston, 2007), Joshua reported that his nightmares were similar to the "scary thing" that happened, and that he did not have nightmares prior to the "scary thing." Joshua clearly identified his most traumatic experience as the death of his best friend in a fire. Joshua indicated that he had bad dreams every night each week and that he had more than one bad dream every night. At post-treatment assessment, Joshua reported having 1 nightmare on the TRNS-C, a significant decrease

from pre-treatment. He reported having no nightmares at the 3-month follow-up. This obviously resulted in a decrease in nights with more than one nightmare. Joshua's reported nights with nightmares and nights with more than one nightmare are graphed throughout pre-treatment, treatment, and post-treatment phases in Figures 10 and 11.

During pre-treatment questions from the Nightmare Distress Questionnaire (NDQ; Belicki, 1992), Joshua reported that when he has been awakened by a nightmare that it was *always* hard to stop thinking about it and get it out of his head, that he was *always* scared to sleep because he might have a nightmare, and that he *always* had trouble knowing what to do about nightmares. He indicated that nightmares *always* seem so real that it is hard to believe they are just dreams. Joshua's reported nightmare-related distress on the NDQ at pre-treatment was clinically significant at a total score of 42. He reported a significant decrease in nightmare distress from pre-treatment (total score = 42) to post-treatment (total score = 8). And another decrease at 3-month follow-up (total score = 2). Joshua's reported nightmare-related distress is graphed throughout pre-treatment, treatment, and post-treatment phases in Figure 12.

During the pre-treatment assessment of anxiety and depression with the Revised Child Anxiety and Depression Scale (RCADS; Chorpita et al., 2000), Joshua responded to several items that were indicative of depression and/or anxiety symptoms. For instance, he reported that he *always* felt sad or empty, *always* had trouble sleeping, *always* felt worried when he went to bed at night, and *often* worried that something awful would happen to someone in his family. On the parent version of the RCADS, Joshua's mother reported that he *often* had trouble sleeping, was *often* scared to sleep on his own, *sometimes* felt sad or empty, and *often* worried when in bed at night. Two of Joshua's RCADS subscale scores were in the clinically significant range at pre-treatment – the depression subscale on the parent-report RCADS (T-score = 78) and the anxiety

subscale on the parent-report RCADS (T-score = 77). Though both of these scores were in the normal range at post-treatment, the depression subscale of the RCADS-Parent was 78 at the 3-month follow-up, representing an overall lack of change in the score. Joshua's mother's report of his anxiety score on the RCADS decreased from pre- to post-treatment ( $T_{pre} = 77$ ;  $T_{post} = 55$ ), it increased at 3-month follow-up ( $T = 61$ ). The drop was still sufficient to result in a non-clinical score at final assessment. His self-report on this measure evidenced a decreased score at post-treatment ( $T_{pre} = 57$ ;  $T_{post} = 42$ ) and again at 3-month follow-up ( $T = 40$ ). Joshua's anxiety and depression scores on the RCADS and the parent version of the RCADS are graphed for pre-treatment and post-treatment phases in Figure 13.

Joshua and his mother came to each assessment and treatment session as scheduled. They were most often on-time and on the couple of occasions when they were not, Joshua's mother called to notify that she was on her way. They have not yet reached the time frame for their 6-month follow-up assessment. In the first treatment session, Joshua identified two goals for his participation in ERRT-C: 1) to sleep better, and 2) to have no nightmares. At pre-assessment, Joshua's mother reported that his prescribed medications included: Intuniv, Buspirone, Clonazepam, Hydroxyzine, and Melatonin. She also indicated that Joshua's medication status did not change throughout the study. His mother reported that any remaining sleep issues at the 3-month follow up were unrelated to nightmares. With his mother's assistance, Joshua completed homework assignments for most days during each week of treatment.



## Visual Inspection of Cognitive Data

Data from both participants was visually examined for changes from pre-treatment to post-treatment and at both 3-month and 6-month follow-ups on all variables of interest. Full results are displayed in Figures 5 through 9 and 14 through 18.

**Hypothesis 1.** Hypothesis 1 posited that attention, short-term memory, and processing speed, as measured by the Letter-Number Sequencing subtest of the WISC-IV (Wechsler, 2003), would improve from pre- to post-treatment with successful completion of ERRT-C in 8- to 13-year-old children who have experienced trauma and suffered from frequent nightmares. Analysis of hypothesis 1 involved the visual examination of the Letter-Number Sequencing subtest scaled scores (see Figures 5 and 14). Visual inspection of data collected suggested improvement from pre- to post-treatment for Joshua (scaled score<sub>pre</sub> = 2; scaled score<sub>post</sub> = 10) but not for Elliot (scaled score<sub>pre</sub> = 9; scaled score<sub>post</sub> = 3). Joshua's post-treatment score was maintained at 3-month follow-up (scaled score = 10). Scores increased for Elliot at 3-month follow-up (scaled score = 11) and again at 6-month follow-up (scaled score = 12). Although results varied somewhat, both participants' scores increased overall. Visual inspection illustrates *improved* scores from pre-treatment to follow-up time periods for attention, short-term memory, and processing speed with successful completion of ERRT-C.

**Hypothesis 2.** Hypothesis 2 predicted that short-term memory, attention, and concentration, as measured by the Digit Span subtest of the WISC-IV (Wechsler, 2003), of 8- to 13-year-old children who have experienced trauma and frequent trauma-related nightmares would improve from pre-to post-treatment with successfully completion of ERRT-C. Analysis of hypothesis 2 involved the visual examination of the Digit Span subtest scaled scores (see Figures 6 and 15). Visual inspection of collected data suggests that scores decreased for Elliot

from pre- to post-treatment (scaled score<sub>pre</sub> = 9; scaled score<sub>post</sub> = 5). However, this decrease was primarily due to Elliot refusing to complete the digit span backward portion of this subtest during the post-treatment assessment session, resulting in a very low total score. Although Elliot's 3-month follow-up score (scaled score = 7) again did not improve over his pre-treatment score, his 6-month follow-up score did increase (scaled score = 11). In total, Elliot showed improvement from pre-treatment to 6-month follow-up. Visual inspection of Joshua's scores suggests a decrease from pre- to post-treatment (scaled score<sub>pre</sub> = 9; scaled score<sub>post</sub> = 8) and again at 3-month follow-up (scaled score = 7). Visual inspection illustrates *inconsistent* scores from pre-treatment to follow-up time periods for short-term memory, attention, and concentration with successful completion of ERRT-C.

To put scores from Hypotheses 1 and 2 in a broader context, the Letter-Number Sequencing and Digit Span subtests have been computed to create Working Memory Indices. At pre-treatment assessment, Elliot attained a score of 94 on the Working Memory Index, a score that falls at the 34<sup>th</sup> percentile and is in the *Average* range (see Table 2). Although this measure indicated a reduced score at post-treatment, it *improved* from post-treatment to both 3-month and 6-month follow-ups (Score<sub>post</sub> = 65, *Extremely Low*; Score<sub>3mos</sub> = 94, *Average*; Score<sub>6mos</sub> = 107, *Average*). At pre-treatment assessment, Joshua attained a score of 74 on the Working Memory Index, a score that falls at the 4<sup>th</sup> percentile and is in the *Borderline* range. His score then *improved* at post-treatment (Score = 94, *Average*) and remained fairly consistent, dropping by 3 points, at 3-month follow-up (Score = 91, *Average*).

**Hypothesis 3.** Hypothesis 3 posited that reading achievement and comprehension, as measured by the R-CBM and MAZE subtests of the Aimsweb Measurement System (Shinn & Shinn, 2002a, b), of 8- to 13-year-old children who experienced trauma and resulting trauma-

related nightmares would improve from pre- to post-treatment with successful completion of ERRT-C. Analysis of Hypothesis 3 involved the visual examination of the R-CBM and MAZE subtest scores (see Figures 7, 8, 16, and 17). Visual inspection of collected data suggests that both R-CBM and MAZE scores increased for Elliot from pre- to post-treatment (R-CBM score<sub>pre</sub> = 127, score<sub>post</sub> = 152; MAZE score<sub>pre</sub> = 20, score<sub>post</sub> = 24). His R-CBM score maintained at 3-month follow-up (score = 150), and his MAZE score again increased (score = 27). Both of Elliot's scores then decreased significantly at 6-month follow-up (R-CBM score = 26; MAZE score = 19). Joshua's R-CBM and MAZE scores both increased steadily from pre- to post-treatment (R-CBM score<sub>pre</sub> = 96, score<sub>post</sub> = 108; MAZE score<sub>pre</sub> = 9, score<sub>post</sub> = 12) and again at 3-month follow-up (R-CBM score = 112; MAZE score = 13).

With the exception of Elliott's final 6-month follow-up scores, all other scores for both Elliot and Joshua increased from pre-treatment to follow-up time periods for reading achievement and comprehension. Taking the questionable validity of Elliott's final score into consideration (see Discussion section), visual inspection illustrates *improved* scores from pre-treatment to follow-up time periods for reading achievement and comprehension with successful completion of ERRT-C.

**Hypothesis 4.** Hypothesis 4 predicted that academic functioning, as measured by GPA, would improve from pre- to post-treatment with successful completion of ERRT-C. Analysis of Hypothesis 4 involved the visual examination of GPA during the pre-treatment and 6-month follow-up assessments for Elliot and pre- and post-treatment assessments for Joshua (based on corresponding grading period; see Figures 9 and 18). GPA was assessed by averaging all progress descriptor grades assigned to each of the areas described (e.g., represent and interpret data) within each individual course heading (e.g., math) according to a 4-1 point scale

(4 = advanced proficiency, 3 = proficient, 2 = nearing proficiency 1 = novice) at both of the schools that Elliott and Joshua attended. Individual course scores are also graphed.

Since Elliot participated in treatment during the summer, his pre-treatment grades were from the end of third grade and his next grading period did not occur until his 6-month follow-up (in fourth grade). There were three primary school subjects that were graded in both third and fourth grades: writing, reading, and math. A visual depiction of these grades is shown in Figure 9. Elliot's overall GPA decreased from a 3.8 at pre-treatment (the end of third grade) to a 3.0 at 6-month follow-up (the first reporting period of fourth grade). His writing grade went from a 3.4 at pre-treatment to a 3.0 at 6-month follow-up. Both, his reading and math grades went from a 4.0 to 3.0 from pre-treatment to 6-month follow-up. Overall, his academic performance worsened.

Pre-treatment and post-treatment fell such that Joshua's first and third grading periods of his fourth grade year were compared. The four primary school subjects that are reported for Joshua include: writing, technology, reading, and math. A visual depiction of these grades is shown in Figure 18. At pre-treatment, Joshua's overall GPA was 1.38 and it increased to a 1.76 at post-treatment. His writing grade went from a 1.0 at pre-treatment to a 1.75 at post-treatment. His technology grades went from 1.0 to 1.33. Reading grades went from 2.0 to 2.17 and math from 1.5 to 1.78. Overall, Joshua's academic performance improved. Visual inspection illustrates *inconsistent* scores from pre- to post-treatment and follow-up time periods for academic performance with successful completion of ERRT-C.

## Discussion

The goal of the present study was to evaluate the impact of successful completion of ERRT-C on the cognitive functions of 8- to 13-year-olds who were exposed to a traumatic experience and who suffered with trauma-related nightmares. Overall, the results provide limited evidence that ERRT-C may have some relationship with cognitive functioning of those children who successfully complete treatment and that this relationship warrants further investigation.

Taking into consideration qualitative impressions gathered throughout assessment and treatment phases, as well as visual inspection of his quantitative data, Elliot may not have been a good fit for ERRT-C. During the phone screen, Elliot's mother indicated that her son's nightmares began prior to his having any of the three traumatic experiences she reported. Additionally, she offered that he was often unable to remember his nightmares and therefore not a good reporter regarding what he dreamt about. Though these factors alone were not exclusionary criteria for Elliot, taken together with additional findings throughout the pre-treatment assessment and treatment phases suggested that Elliot may not have been experiencing distressing trauma-related nightmares. For instance, during the pre-treatment assessment Elliot reported that he had not experienced a "scary thing," that he had seven or more different bad dreams, and that his nightmares always differed. It was unclear at the pre-treatment assessment if at least one or two of his nightmares were particularly vivid, distressing, or repetitive; thus, he was included in the study. Ultimately, Elliott had difficulty with the rescription technique included in Session four of ERRT-C. At first, he refused to do the rescription exercise. Though this was initially conceptualized as avoidance, he eventually completed the rescription but he struggled in choosing a target nightmare and with including details. It remains unclear if

Elliott's difficulties resulted from not having specific or clear, distressing nightmares, avoidance of discussing or drawing his existing nightmare(s), or a lack of engagement in treatment. He appeared to continue to carefully consider questions and respond honestly; however, his difficulties with the rescription aspect of treatment and his inability to report on the details of his nightmares likely affected his data.

Despite Elliot's apparent lack of fit for ERRT-C, his reported nights with nightmares and related distress about them decreased from pre-treatment assessment to 6-month follow-up, though notably his distress scores never met levels of clinical significance. His self-reported and parent-reported depression and anxiety, which have been found to have a relationship with sleep problems in children, were difficult to interpret and at times contradictory. Elliot's reported depression symptoms ultimately increased from pre-treatment to 6-month follow-up in both his own self-report and his mother's. Notably, Elliot's self-report, though increased overall, remained in the normal range of scores; whereas, his mother's was reported at clinically significant levels throughout. His self-reported anxiety decreased from pre-treatment to 6-month follow-up; however, his mother's report indicated that his anxiety increased. Both Elliot and his mother reported anxiety scores within normal limits. Perhaps Elliot's depression and observed anxiety were simply unrelated to sleep problems or because Elliot was unable to participate successfully in rescription, ERRT-C did not impact his overall depression and anxiety scores. It is also possible that Elliot reported a decrease in nightmares and distress, even while his anxiety and depression symptoms increased, because he believed that treatment would end if he reported decreased frequency of nightmares and distress. Another consideration is that Elliott was struggling with depression symptoms, and related irritability and difficulty engaging in treatment, and experienced no *trauma*-related nightmares or *trauma*-related distress thus

suggesting that Elliot would have been a better fit for a different form of treatment. Indeed, research supports irritability in place of sadness as an expression of mood issues in children, and this was evidenced in Elliot's occasional responses to certain aspects of treatment (e.g., similar questions occurring across assessment measures, curriculum-based measures seeming too much like "school," refusal to discuss his nightmares, etc.; Brotman et al., 2006)

Despite these confounding findings, ERRT-C appears to have had a relatively positive impact on Elliot's cognitive functioning, given that all of his cognitive domains increased in scoring overall from pre-treatment assessment to 3-month follow-up. His Letter-Number Sequencing scores increased at 3-month follow-up and again at 6-month follow-up; Digit Span scores also increased at 6-month follow-up. His reading achievement and comprehension scores increased from pre- to post-treatment and maintained this increase at 3-month follow-up. However, at 6-month follow-up, Elliot's scores in these areas decreased significantly. Rather than this being a valid reflection of Elliot's reading achievement and comprehension, this drop is more likely due to his intense dislike of curriculum-based reading measures he reported to have encountered far too frequently at school. Lastly, Elliot's academic performance decreased from pre-treatment to 6-month follow-up. He was a bright child, who was often "bored" in school and reported that he disliked it. Elliot's mother was considering home-schooling, as she felt he was not engaged in school-work due to it being too easy. Perhaps these were contributing factors to the drop in Elliot's course grades. It is possible that his lack of engagement in treatment played some part in a lack of improvement. It would be difficult to know.

ERRT-C includes specific focus on developing healthy sleep hygiene and relaxation skills. In keeping with one possible explanation for Elliot's outcomes, above, even if Elliot was not experiencing *trauma*-related nightmares or subsequent distress, these techniques could be

useful for anyone struggling with sleep problems or mood issues. Thus, one explanation for these findings is that Elliot benefited from some, though perhaps not all, of the techniques embedded within the ERRT-C model and these benefits manifested in improved ability to sleep better, concentrate, and attend.

In contrast to Elliot, Joshua seemed to be a very good fit for ERRT-C. During the phone screen, Joshua's mother indicated that her son's nightmares had clearly become progressively worse after his best friend died in a house fire. Additionally, she reported that his nightmares often centered on the same theme and that though it caused Joshua anxiety to talk about them, he could recall and report details regarding his nightmares. Joshua specifically voiced wanting help with his nightmares and was encouraged that his participation may help other children suffering with nightmares. At the post-treatment assessment, Joshua's mother reported that his increased confidence, due to having an active role in decreasing his own nightmares, had impacted all areas of Joshua's life. She explained that problems did not worry him any longer and that he felt he could solve them. Joshua reported that he was no longer scared to go to sleep and that he was able to help his friends who had nightmares, referring to himself as the "defender of dreams."

Joshua's apparent fit for ERRT-C resulted in consistently decreased nights with nightmares and related distress about them. This steady decline occurred from pre-treatment assessment to post-treatment, and then again at 3-month follow-up. Joshua's mother endorsed enough depression and anxiety symptoms to score in the clinically significant range for both scales. Although she reported an overall decrease in Joshua's anxiety (to non-clinical levels), at 3-month follow-up, she indicated that his depression score had remained unchanged. Of note is that his self-report of neither depression nor anxiety coincided with his mother's and neither was ever clinically significant. Further, Joshua's self-reported depression and anxiety incrementally



decreased from pre- to post-treatment and again at 3-month follow-up. Given Joshua's mother's qualitative report that the skills and confidence he had obtained regarding rescripting his nightmares had improved every aspect of his life, it was surprising that her report of his depression symptoms remained relatively unchanged. It is possible that Joshua's observed depression was related to other life difficulties. It is also noteworthy that Joshua's self-reports had poor concordance with his mother's. His own report may be a better indication of his true depression ratings, due to the prevalent finding that children are more accurate reporters of their internalizing symptoms than their caregivers (Reich, 2000). Because the 6-month follow-up assessment was not in the data collection window for the current study, it is unknown whether further changes will be seen in these scores.

Joshua's cognitive functioning appears to have increased overall from pre-treatment assessment to 3-month follow-up. While his Digit Span subscale scores decreased at post-treatment, and again at 3-month follow-up, his Letter-Number Sequencing scores increased from pre- to post-treatment and maintained this increase at 3-month follow-up. These scores are measures of performance on particular days and due to test error may not be exactly the same on different days. When these subtest scores were computed within the context of an index score, both participants showed an overall increase from pre-treatment to their respective follow-ups.

Joshua's reading achievement and comprehension scores increased from pre- to post-treatment and again at 3-month follow-up. This outcome is particularly notable and encouraging given the research on reading ability and overall academic success (Cappella & Weinstein, 2001; Cullinan, 2000). It is possible that this increase in cognitive functioning is directly related to Joshua's gain in sleep quantity and quality due to a complete lack of nightmares upon treatment completion. By observation, he presented as far more focused, relaxed, and confident in follow-

up sessions. Finally, Joshua's overall academic performance increased from pre- to post-treatment, as well as in all individual courses. In contrast to Elliot's lack of engagement, perhaps Joshua's desire to receive help for his nightmares and his positive engagement in the rescripting process in particular contributed to his improvement in academic achievement. Indeed, his mother indicated that his behavior at school had improved tremendously. Less concern and worry about impending nightmares, better quality sleep, and improved self-confidence could logically translate into more engagement and higher performance scores.

Quantitative data, obtained verbally from phone-screening and pre-treatment assessment interviews, contributed to the overall picture of each of these young boys' trauma experiences and their fit with treatment. Direct observations and further verbal self-reports, as well as treatment outcome measures (e.g., TRNS-C, NDQ, RCADS), provided case context. Context allowed conclusions to be drawn that a better treatment fit would likely result in better outcomes for the treatment itself and for clarification of the relationship of successful treatment completion with cognitive functioning. It is also worth noting that Joshua reported nightmares with a very similar theme to his trauma experience, suggesting that this similarity may also contribute to better outcomes.

In conclusion, Hypothesis 1 was supported by visual inspection of participants' attention, short-term memory, and processing speed scores as measured by the Letter-Number Sequencing subscales of the WISC-IV (Wechsler, 2003) from pre-treatment to follow-up time periods. Given the data collection time periods, we had the availability of long-term outcomes in addition to pre- and post-treatment assessments. Hypothesis 2, which stated that improvements in short-term memory, attention, and concentration as measured by the Digit Span subscale of the WISC-IV would occur from pre- to post-treatment, was not supported overall given that results

were inconsistent. The WISC-IV Digit Span subtest has been used to assess cognitive ability in the literature, apart from the WISC-IV as a whole; however, it is possible that this measure was not sensitive enough to change or a valid measure of short-term memory, attention, and concentration independently. Further, no other independent measure of these constructs was universally identifiable in the literature, which is why the principal investigator utilized two subtests (Digit Span and Letter-Number Sequencing) with some degree of overlapping construct validity to address these particular cognitive areas. However, given some of the conflicting results between these WISC-IV subtests, it is possible that triangulating measurement constructs was not sufficient and may call into question the use of these measures, alone, as valid measures of certain cognitive abilities.

Hypothesis 3 was supported by visual inspection of participants' reading achievement and comprehension as measured by the Aimsweb Measurement System (Shinn & Shinn, 2002a, b) from pre- to post-treatment. Improved scores were maintained at 3-month follow-ups. As stated, the relevance of potentially being able to impact individuals' reading proficiency is notable (Cappella & Weinstein, 2001; Cullinan, 2000). Hypothesis 4, which stated that academic functioning as measured by GPA would improve from pre- to post-treatment, was not supported overall given that results were not consistent. However, Joshua went through the treatment more motivated to engage in activities that would assist him in directly dealing with his nightmares and ultimately more successful in completion of this brief intervention. Because a relationship between sleep quantity and academic achievement has been supported in the literature (Astill et al., 2012), and based on Joshua's more successful completion of ERRT-C, it is not surprising that Joshua experienced an increase in GPA scores even though Elliot did not.

The findings of this study support the hypotheses that processing speed, reading achievement and comprehension, as well as some aspects of attention, and short-term memory improved upon successful completion of ERRT-C. These results contribute to the limited knowledge of the impact of a trauma-related nightmares and their treatment for children on cognitive functioning and academic performance. This knowledge, combined with future studies is expected to highlight the importance of specifically addressing nightmares within the context of trauma-related treatment.

### **Limitations**

Despite some promising results, this study has certain limitations. First, generalizability of results would be difficult due to the case study design and small number of participants. Further, the lack of a control group resulted in an inability to compare other methods of therapy and to determine if results were due to treatment or to non-specific factors. Additional studies with greater methodological control and larger samples will be needed to establish ERRT-C's relationship with cognitive functioning. In addition, this study points to the need for an additional screening question or set of questions to be added to the phone screening process for the study. Indeed, a revision of the inclusion/exclusion criteria may be necessary in order to avoid a situation similar to Elliot's whereby his overall fit with treatment may have been a factor in his conflicting results.

Another consistent consideration and confounding variable in any research involving children is their own development process. Although numerous improvements appeared to occur in some relation to ERRT-C, what role the child's own developmental process played in these improvements across time is unknown.

## **Conclusions**

To the best of our knowledge, this study is the first to assess the effect of successful completion of a post-trauma nightmare treatment on the cognitive functions of children. Although it is not possible to conclude that ERRT-C led to the observed positive changes, the results of this study provided limited preliminary evidence that Exposure, Relaxation, and Rescripting Therapy for children (ERRT-C) should be evaluated further regarding its relationship with cognitive functions. ERRT-C may be beneficial for those experiencing post-trauma nightmares by improving cognitive functions. The results of the present study could inform clinicians about the importance of addressing nightmares and sleep disturbance directly impacted by trauma. Given the detrimental consequences of trauma on children's sleep quality and perhaps their cognitive functioning as well, when made aware of trauma, clinicians should make it common practice to inquire about nightmare experiences and provide treatment to specifically address them. More stringent research studies, including randomized control trials, with a larger number of participants need to be conducted to further establish this treatment's full impact on cognitive functioning.

Table 1

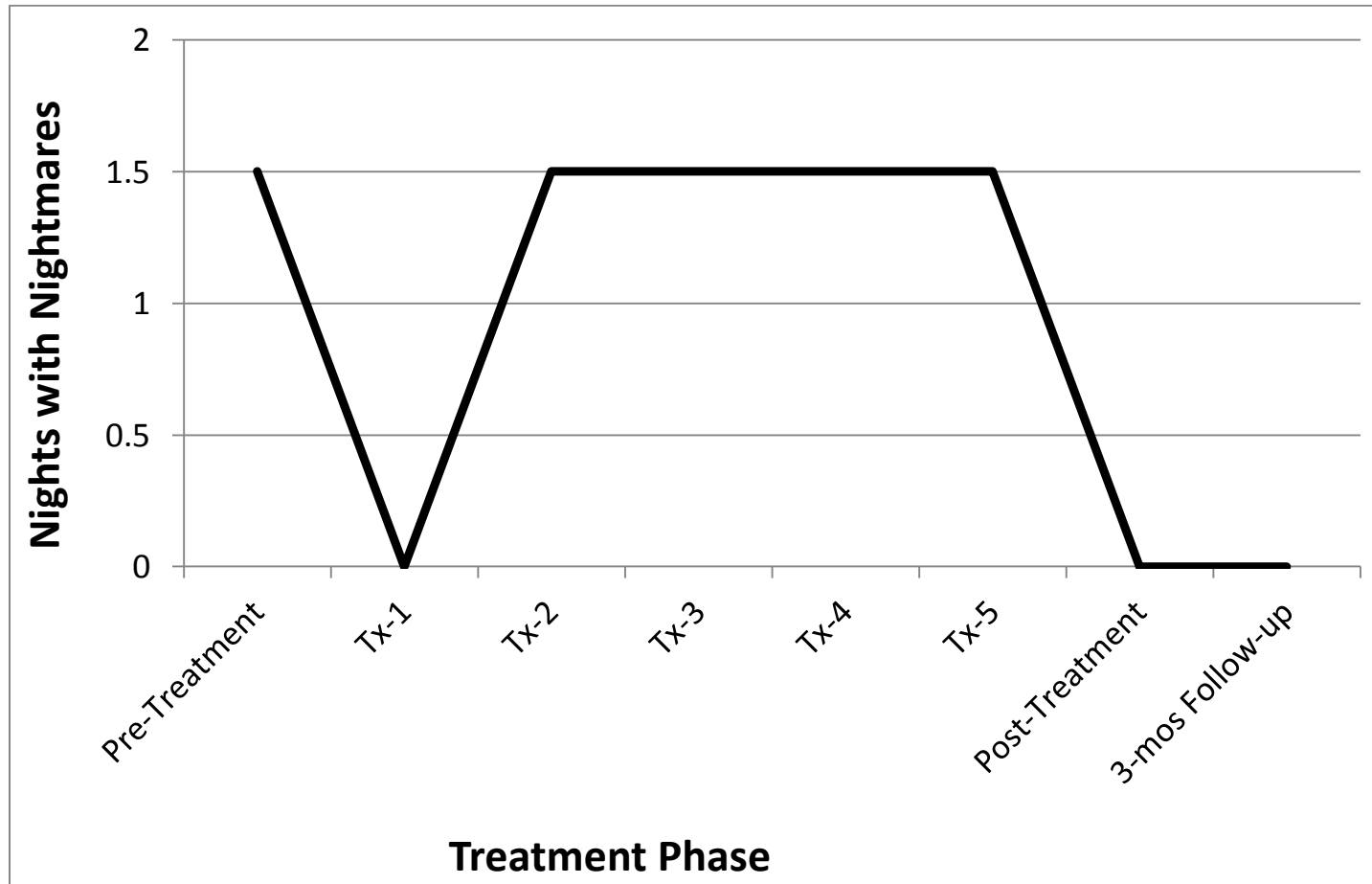
*Participant Demographic Information*

	Participant 1 Elliot	Participant 2 Joshua
Age	9	10
Gender	Male	Male
Ethnicity	White	White
Parent	Biological Mother	Biological Mother
Parent Age	29	38
Marital Status	Divorced	Married
Income	< \$20,000	< \$20,000
Trauma	Traumatic Divorce	Best Friend Died in Fire
Medication	None	Intuniv Buspirone Clonazepam Hydroxyzene Melatonin

Table 2

*Working Memory Indices*

	Composite Score	Percentile	95% Confidence Interval	Descriptor
Elliot				
Pre-Treatment	94	34	87-102	Average
Post-Treatment	65	1	60-75	Extremely Low
3-month Follow-up	94	34	87-102	Average
6-month Follow-up	107	68	99-114	Average
Joshua				
Pre-Treatment	74	4	68-84	Borderline
Post-Treatment	94	34	87-102	Average
3-month Follow-up	91	27	84-99	Average



*Figure 1.* Frequency of nightmares reported on the TRNS-C (Langston, 2007) during pre-treatment, treatment, and post-treatment phases for Elliot (Participant 1).



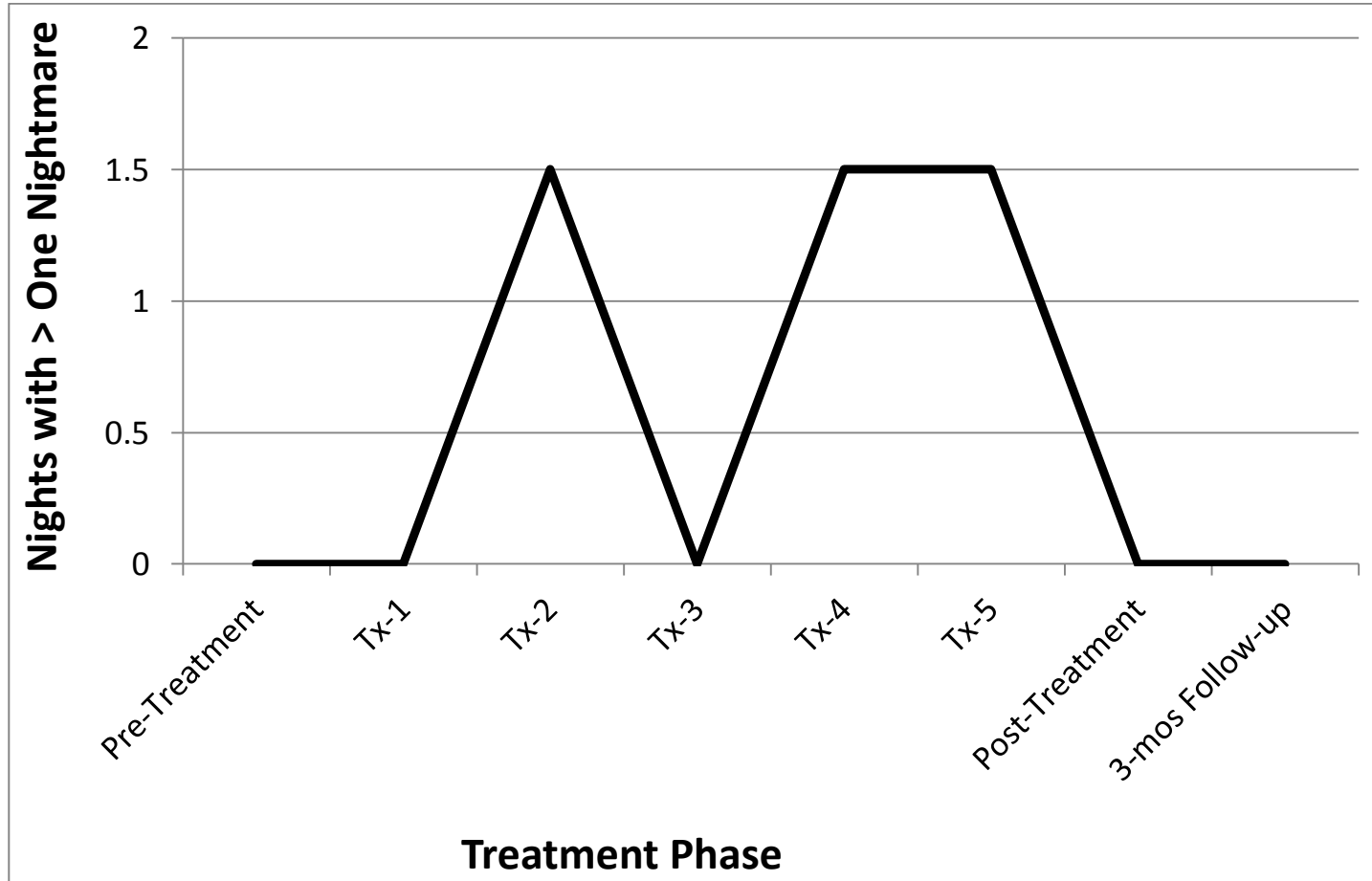


Figure 2. Frequency of nights with more than one nightmare reported on the TRNS-C (Langston, 2007) during pre-treatment, treatment, and post-treatment phases for Elliot (Participant 1).

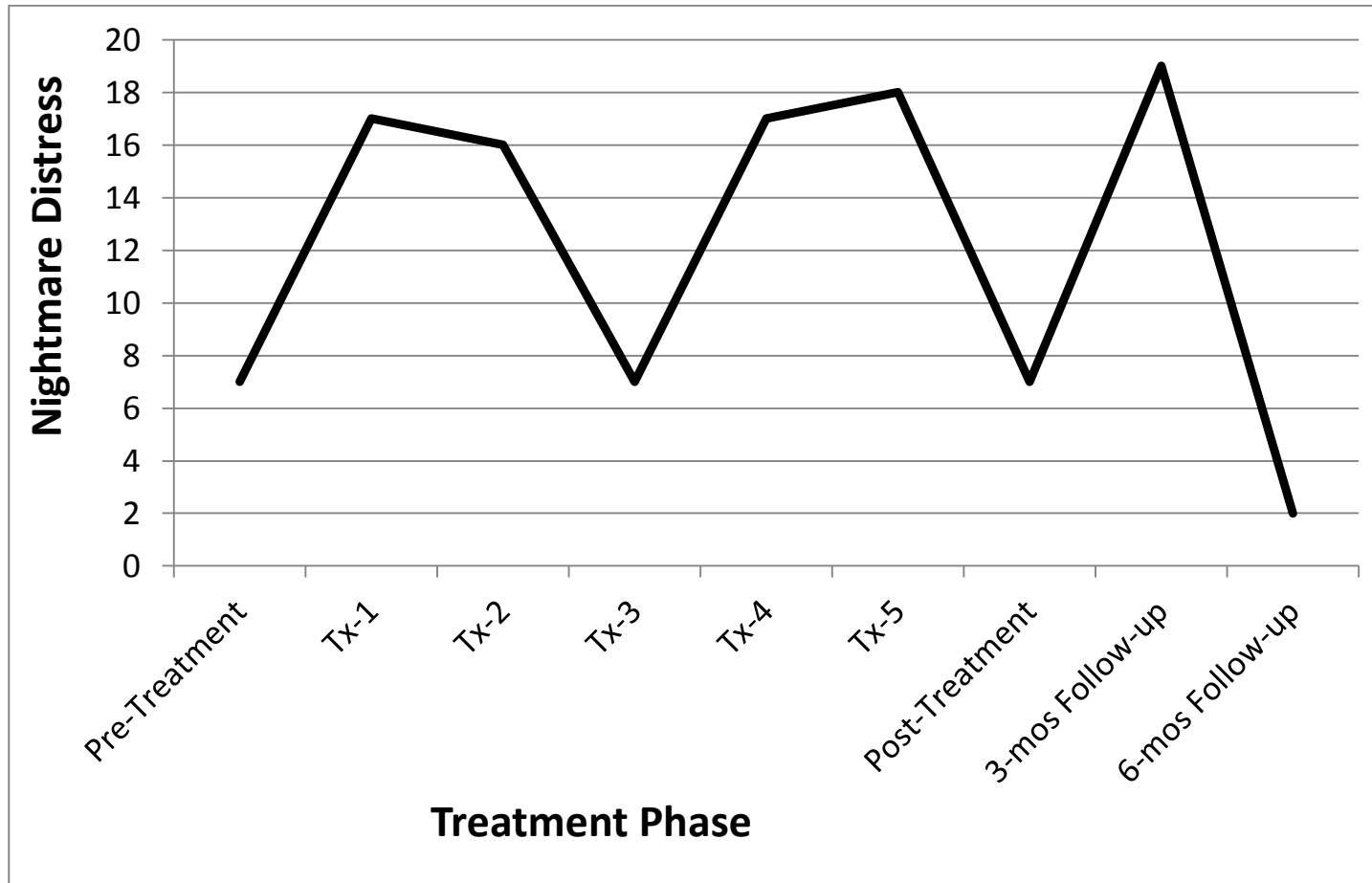


Figure 3. Nightmare distress reported on the NDQ (Belicki, 1992) during pre-treatment, treatment, and post-treatment phases for Elliot (Participant 1). Elliot reported no clinically significant scores ( $> 21$ ).

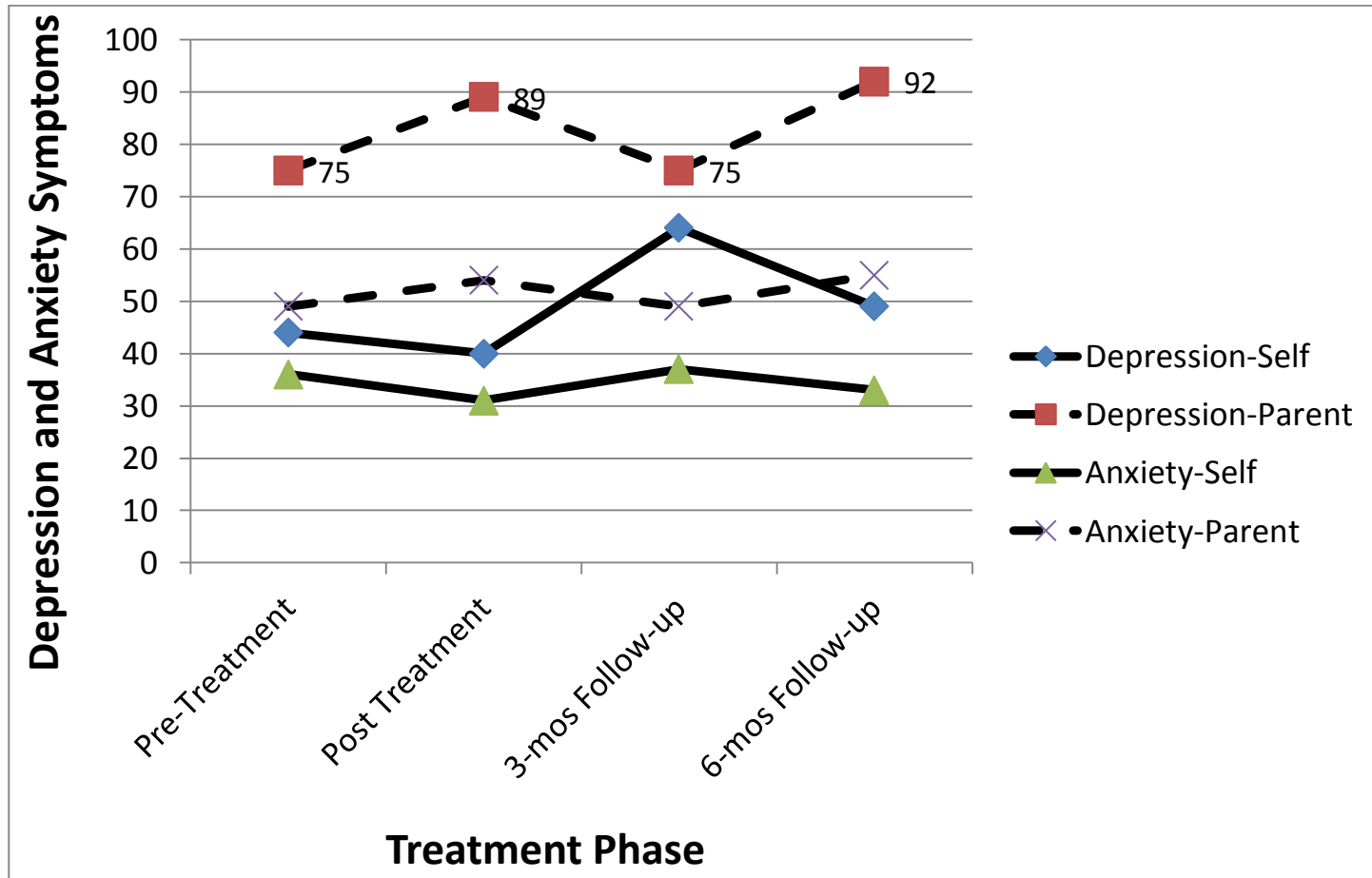
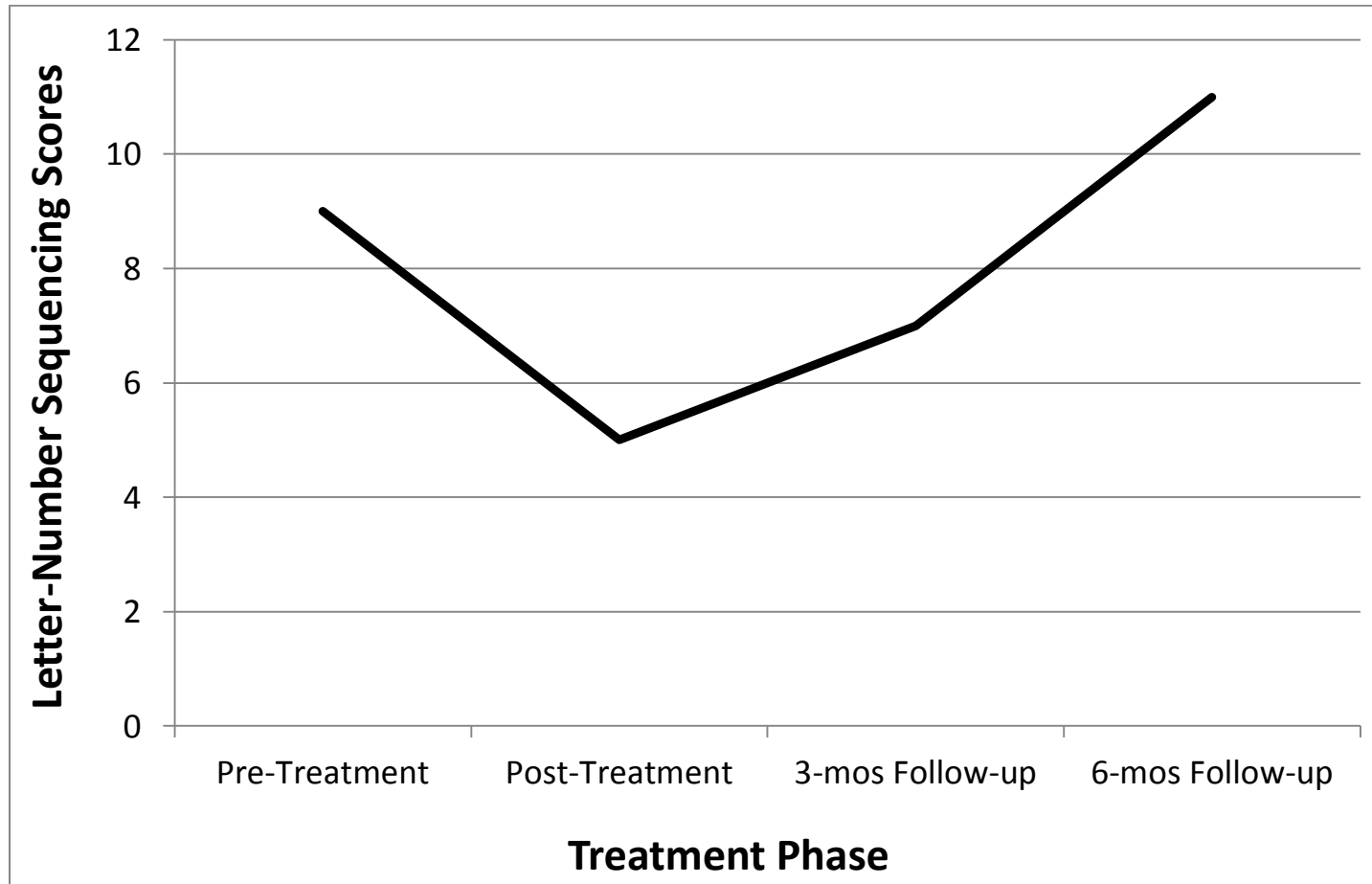
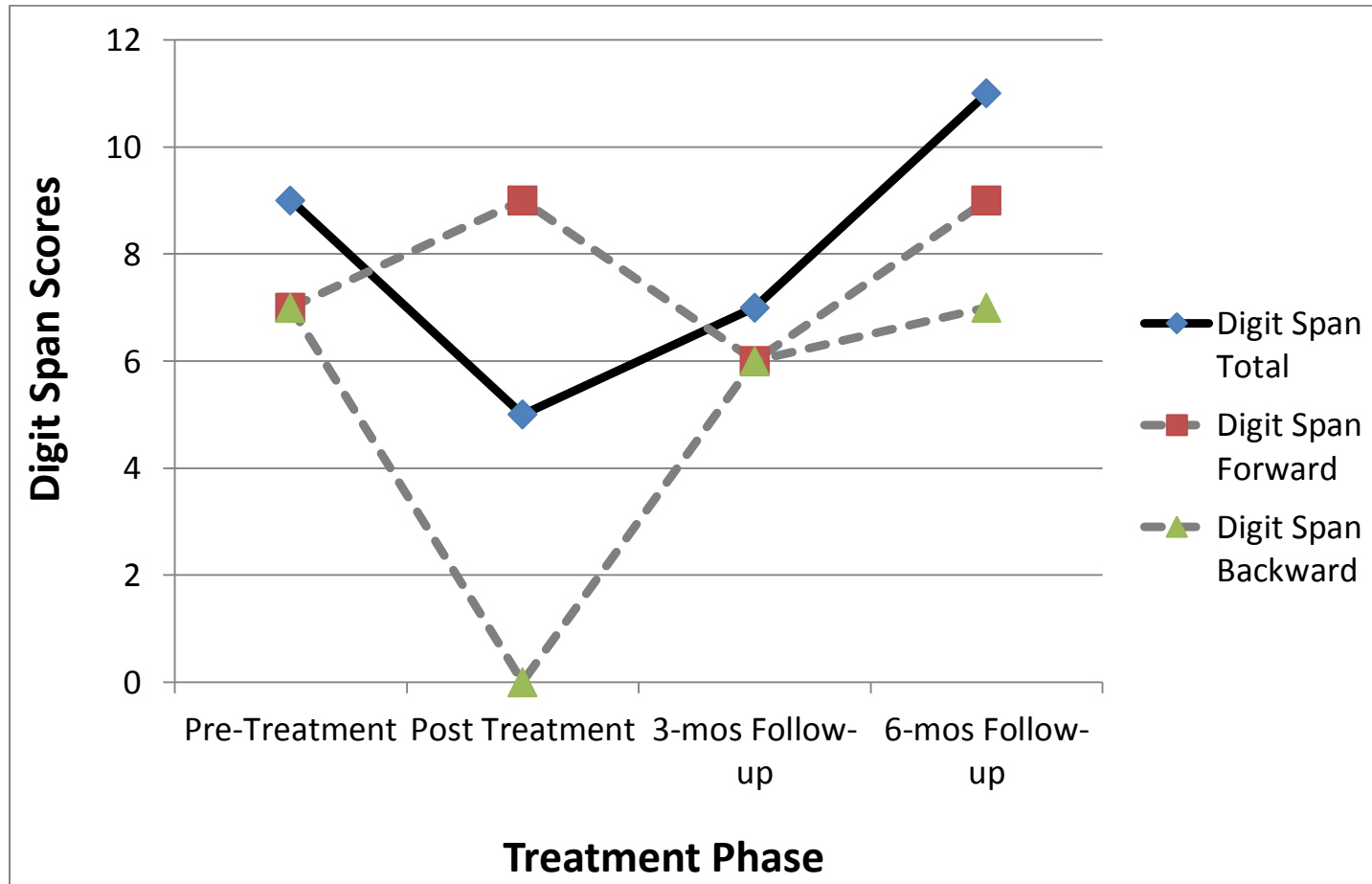


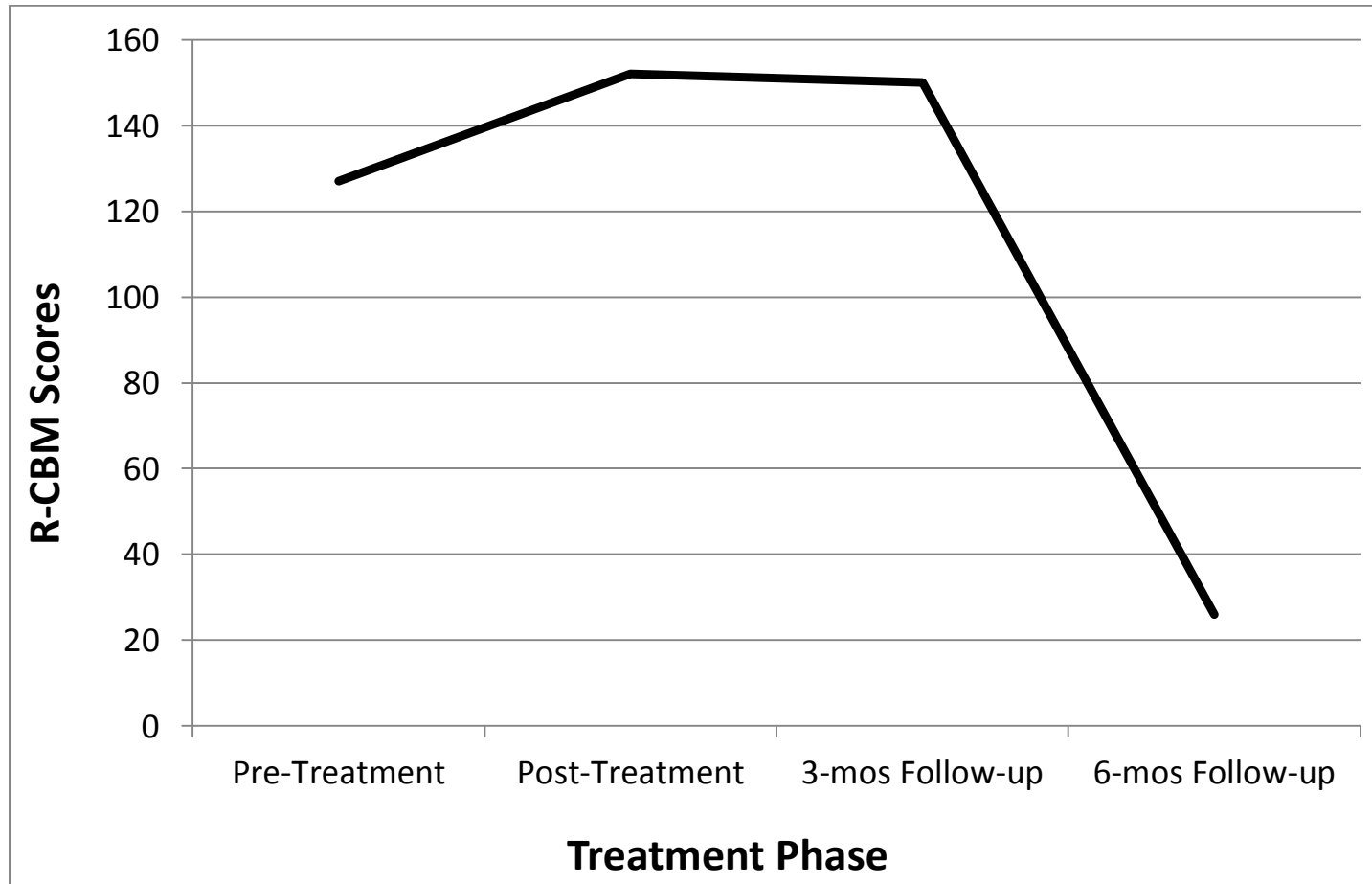
Figure 4. Pre-, post-, and follow-up treatment RCADS (Chorpita et al., 2000) depression and anxiety scores for Elliot (Participant 1). Significant T-scores are indicated.



*Figure 5.* Pre-, post-, and follow-up treatment scores for attention, short-term memory, and processing speed for Elliot (Participant 1). The Letter-Number Sequencing (WISC-IV; Wechsler, 2003) scores are charted as scaled scores.



*Figure 6.* Pre-, post-, and follow-up treatment scores for short-term memory, attention, and concentration for Elliot (Participant 1). Both the Digit Span Forward and Digit Span Backward (WISC-IV; Wechsler, 2003) scores are charted as raw scores. The Digit Span Total scores are charted as scaled scores.



*Figure 7.* Pre-, post-, and follow-up treatment scores for general reading achievement and comprehension (R-CBM; Shinn & Shinn 2002a) for Elliot (Participant 1).

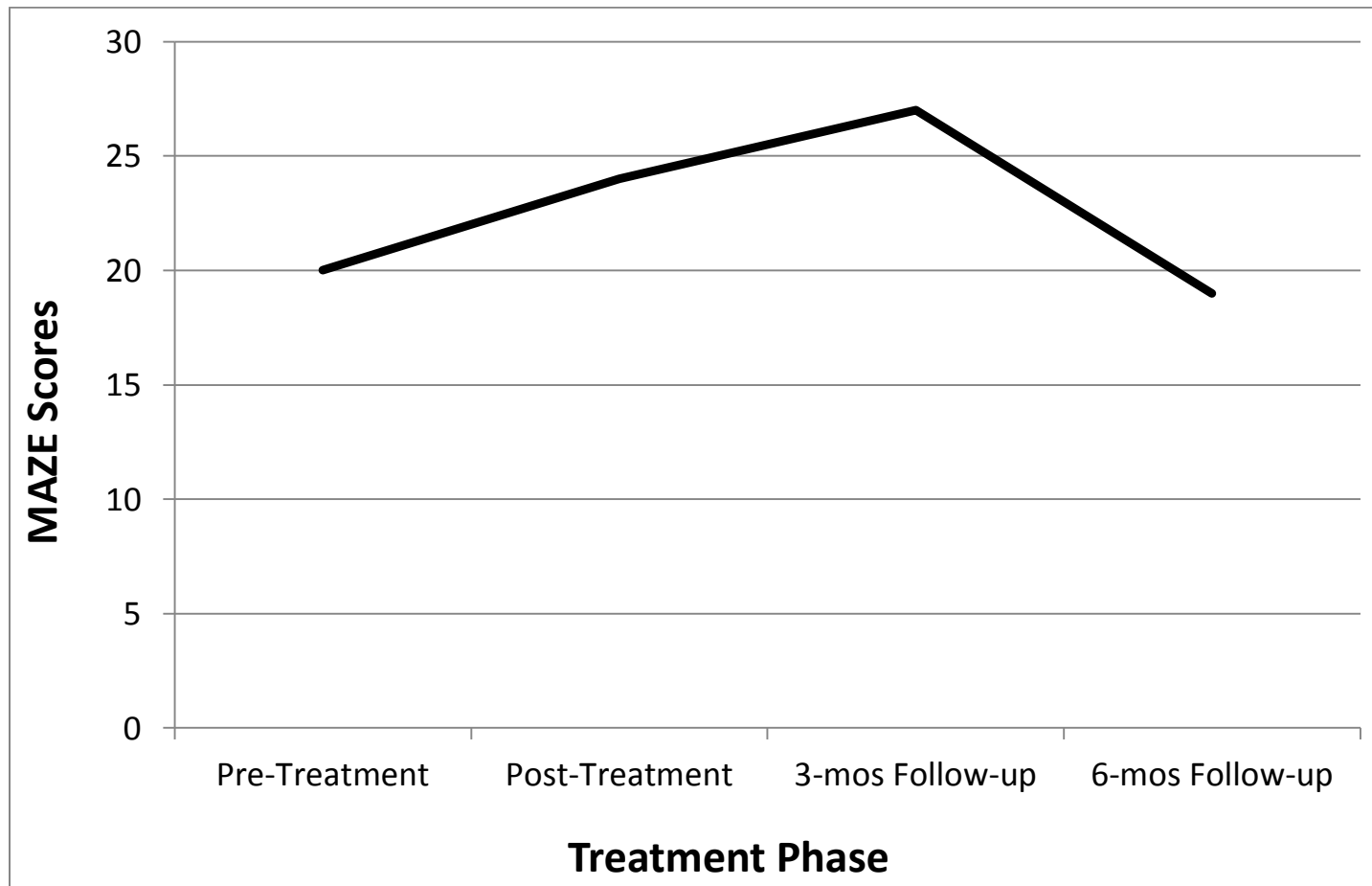


Figure 8. Pre-, post-, and follow-up treatment scores for general reading achievement and comprehension (MAZE; Shinn & Shinn 2002b) for Elliot (Participant 1).

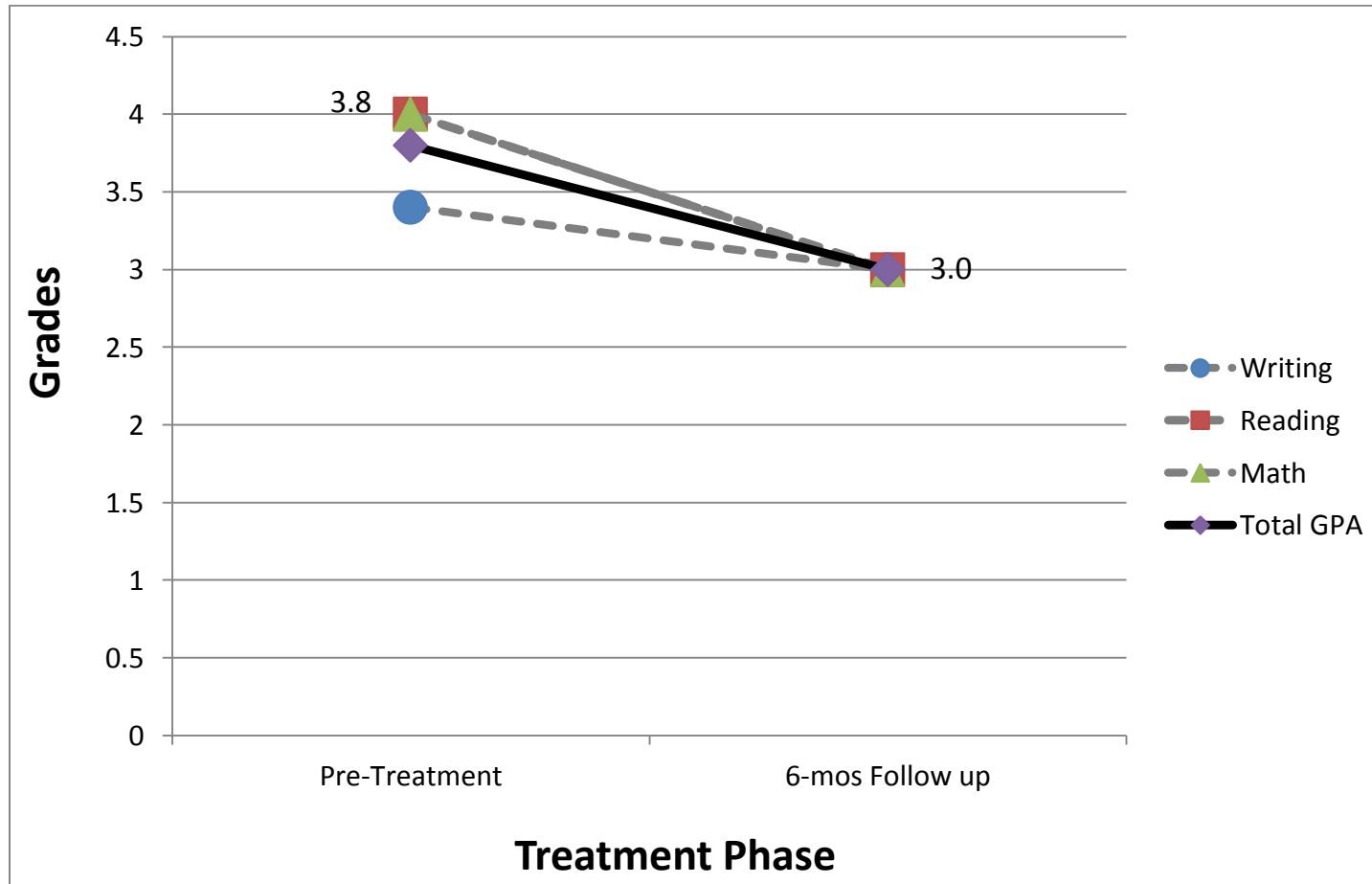


Figure 9. Pre-treatment and 6-month follow-up treatment academic performance scores (Grades) for Elliot (Participant 1).



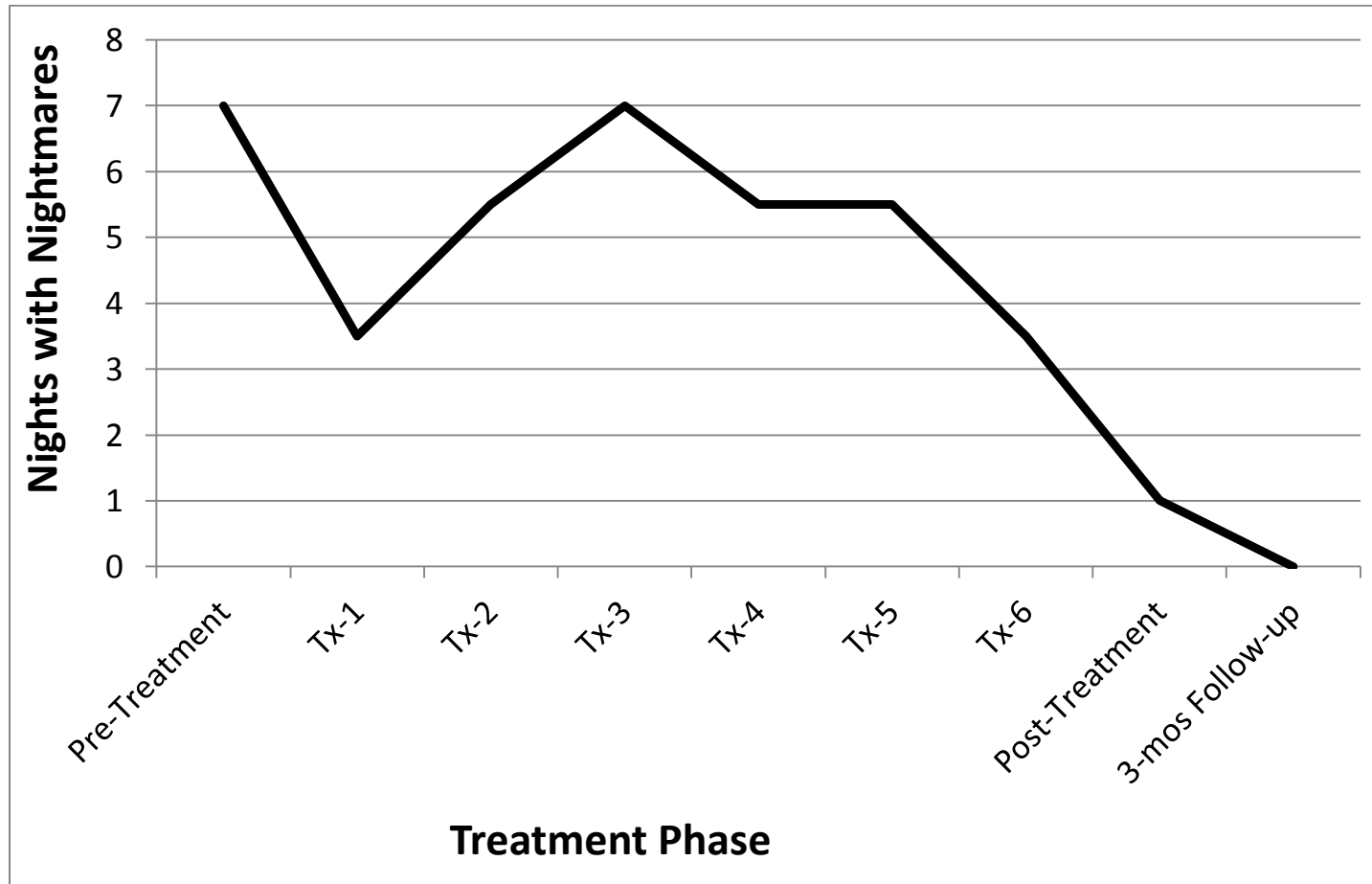


Figure 10. Frequency of nightmares reported on the TRNS-C (Langston, 2007) during pre-treatment, treatment, and post-treatment phases for Joshua (Participant 2).

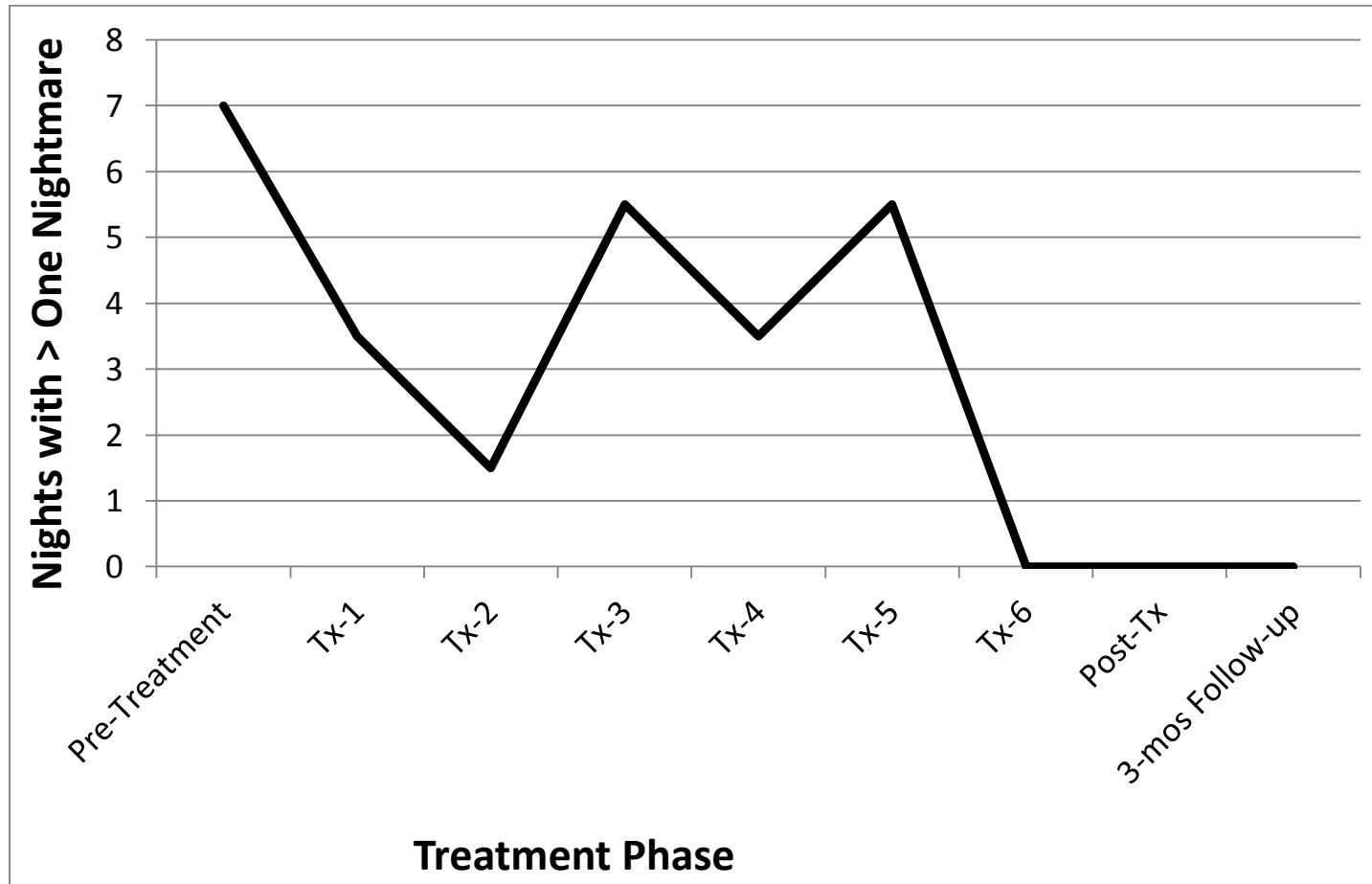


Figure 11. Frequency of nights with more than one nightmare reported on the TRNS-C (Langston, 2007) during pre-treatment, treatment, and post-treatment phases for Joshua (Participant 2).

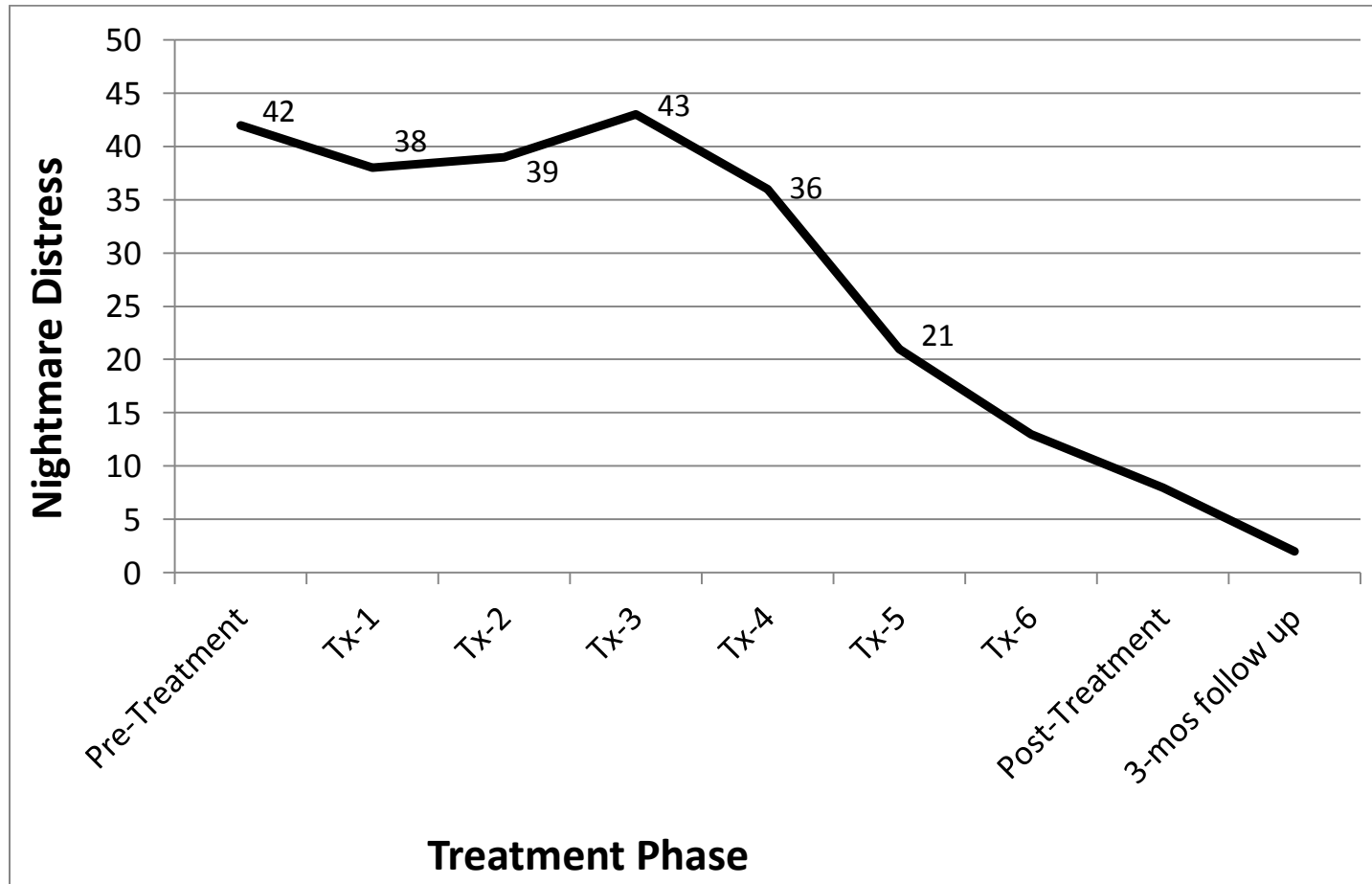


Figure 12. Nightmare distress reported on the NDQ (Belicki, 1992) during pre-treatment, treatment, and post-treatment phases for Joshua (Participant 2). Clinically significant scores (> 21) are indicated.

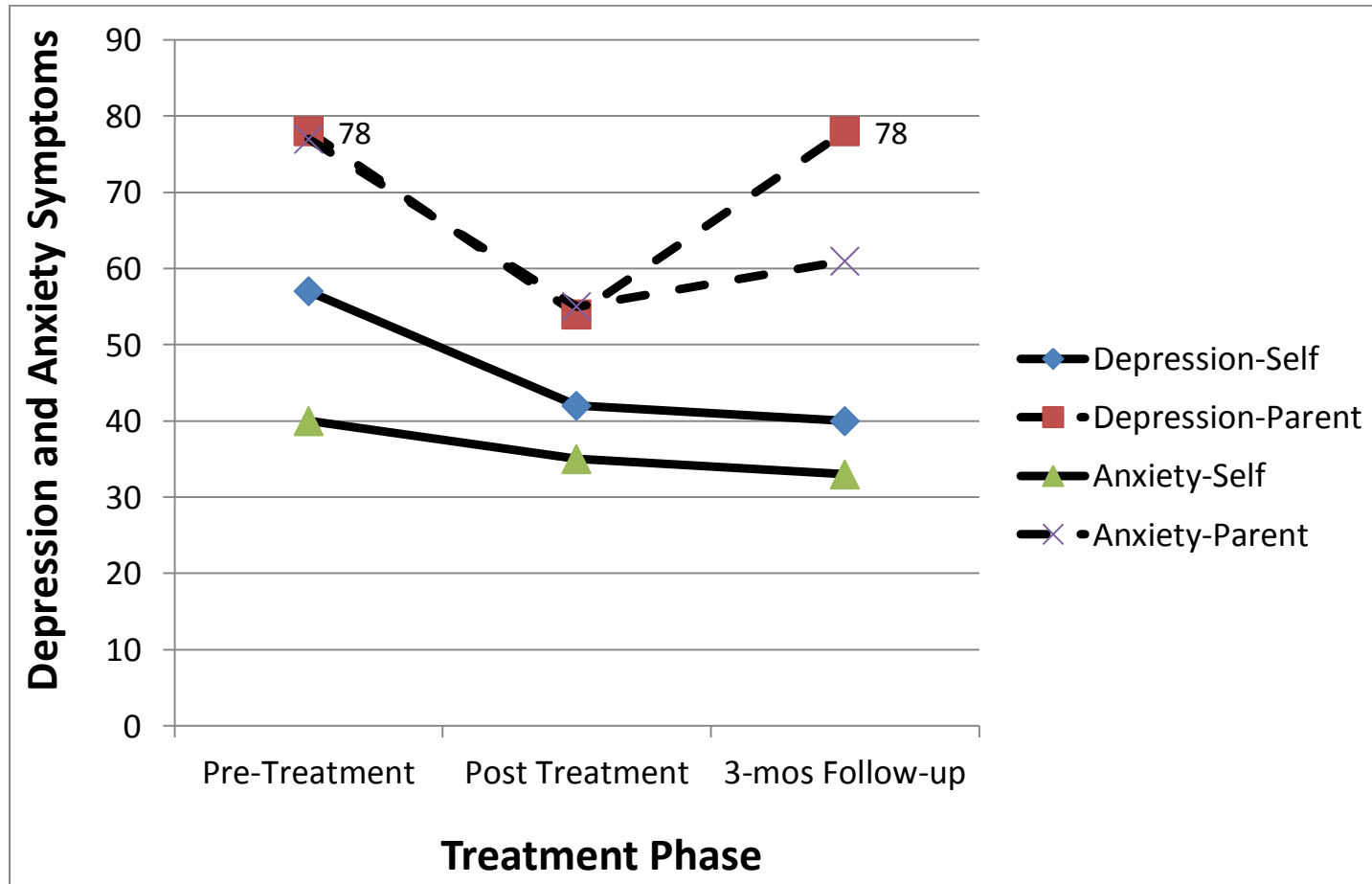
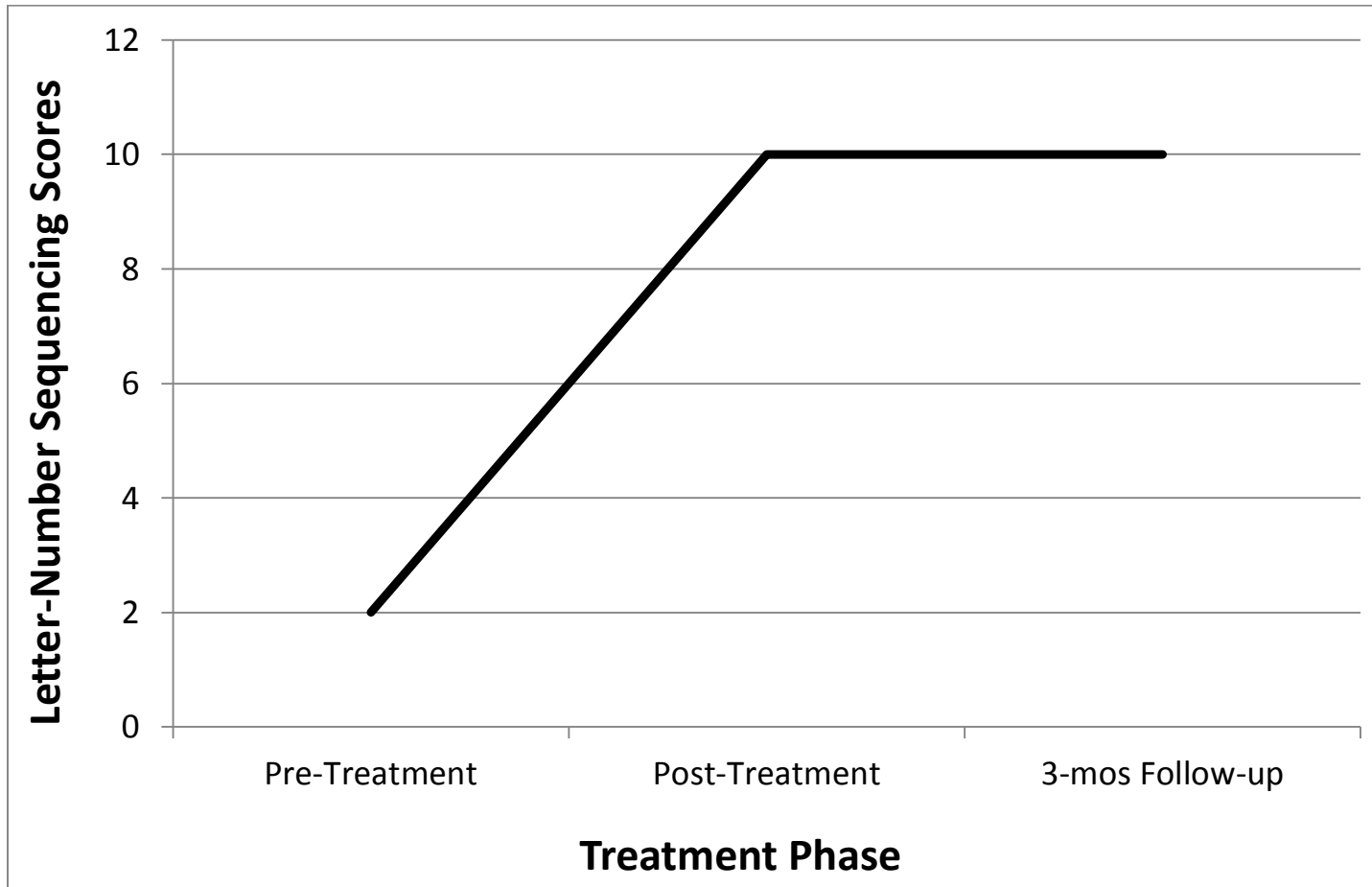
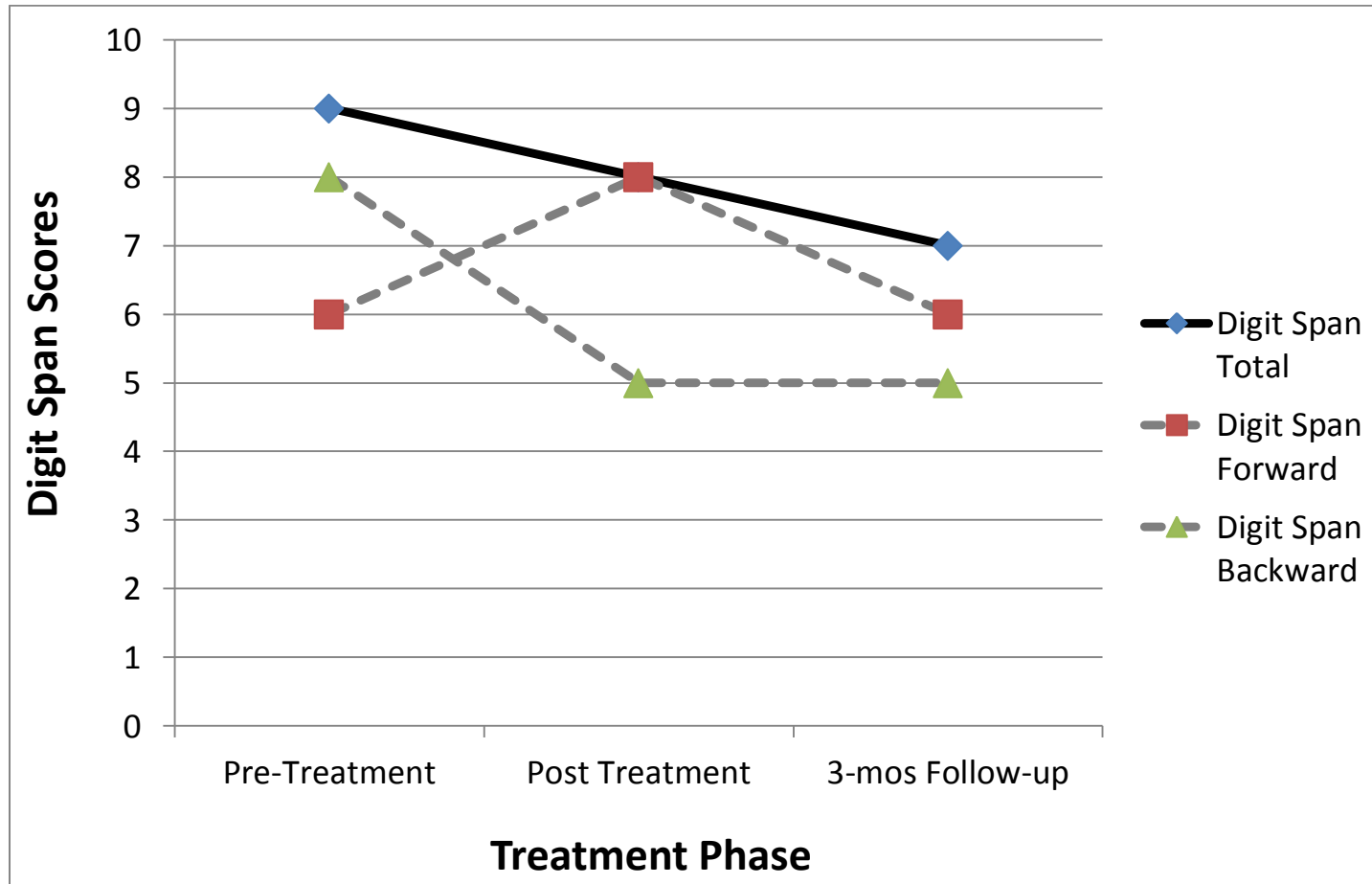


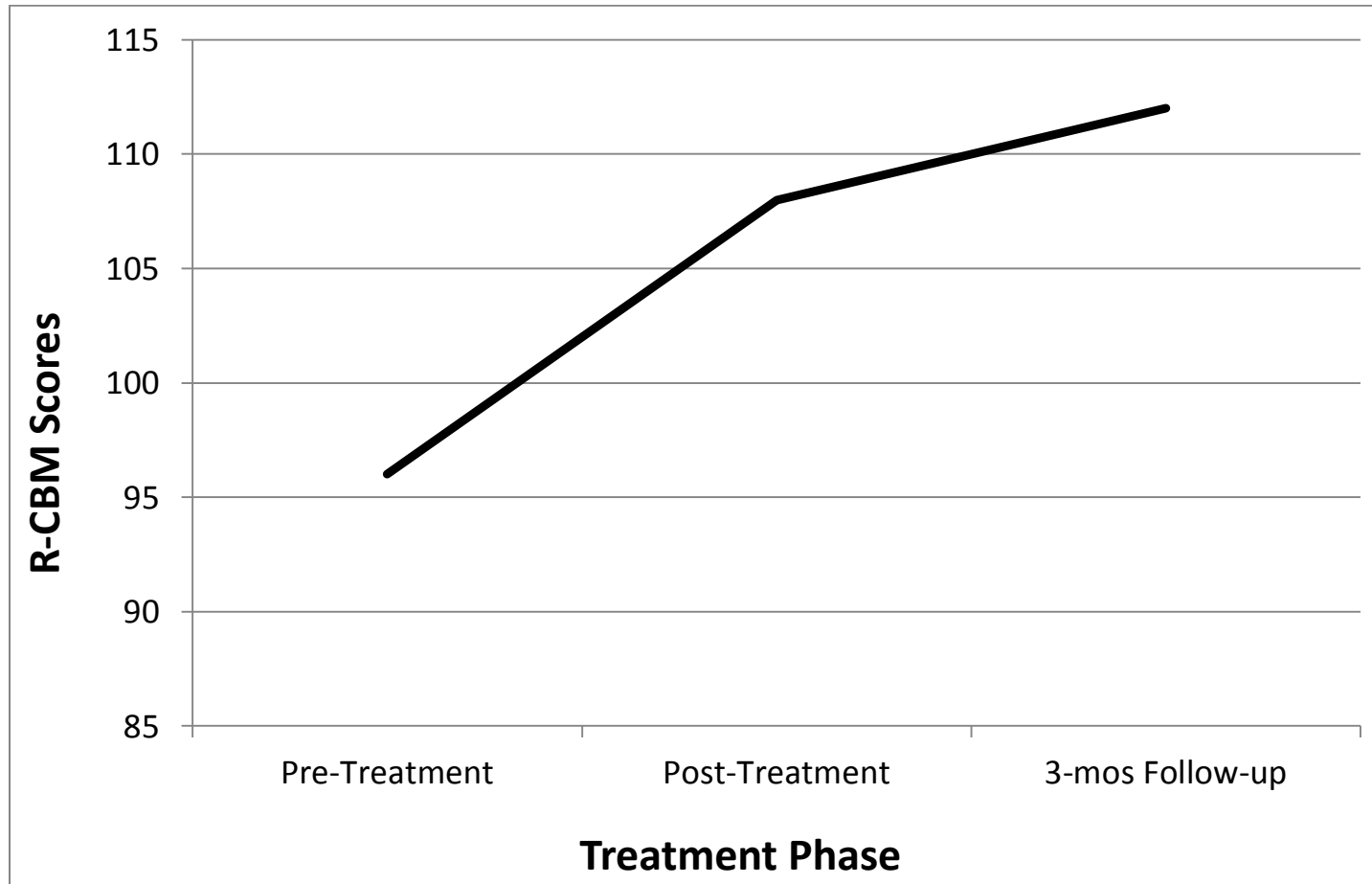
Figure 13. Pre-, post-, and follow-up treatment RCADS (Chorpita et al., 2000) depression and anxiety scores for Joshua (Participant 2). Significant T-scores are indicated.



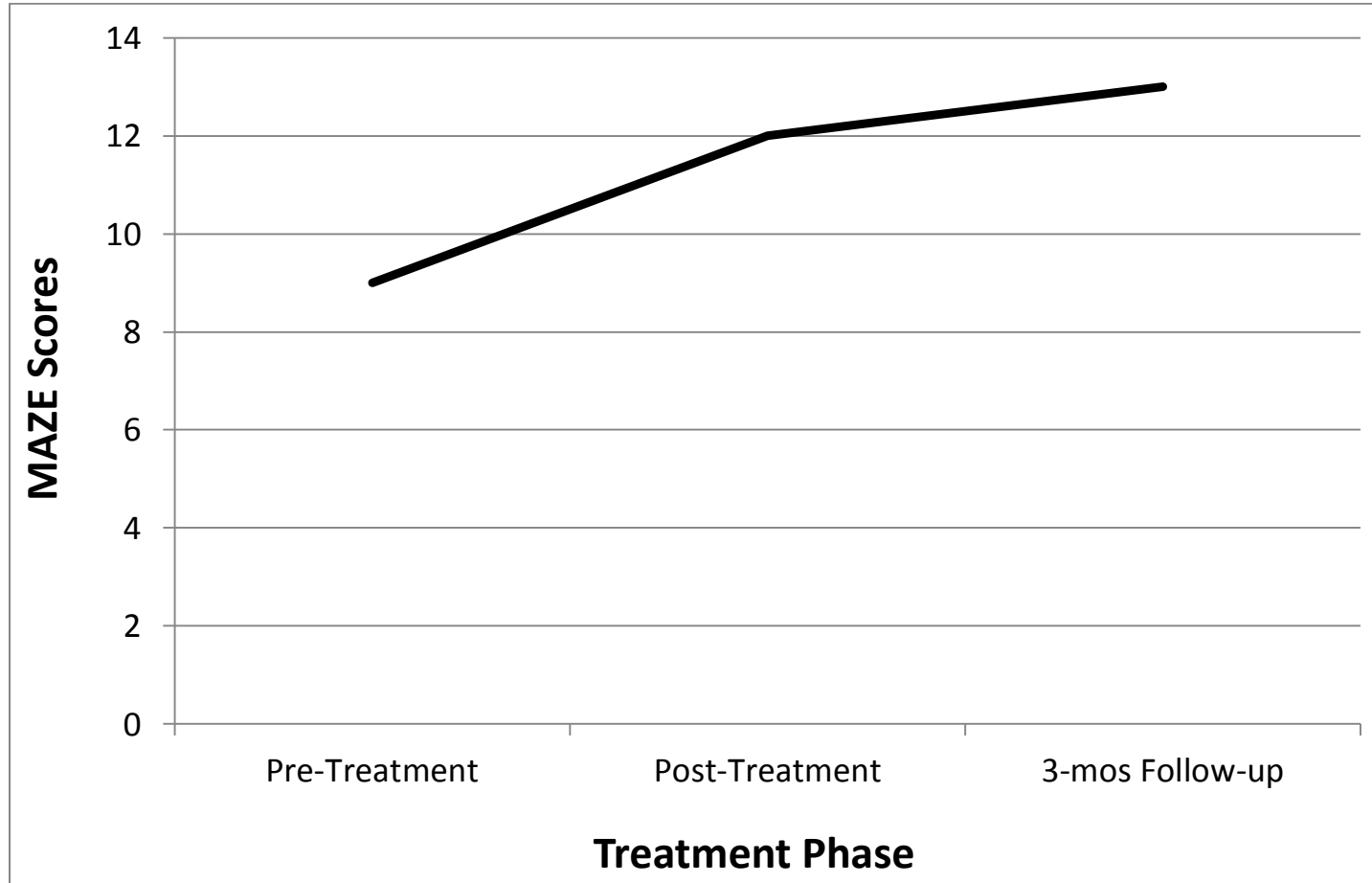
*Figure 14.* Pre-, post-, and follow-up treatment scores for attention, short-term memory, and processing speed for Joshua (Participant 2). The Letter-Number Sequencing (WISC-IV; Wechsler, 2003) scores are charted as scaled scores.



*Figure 15.* Pre-, post-, and follow-up treatment scores for short-term memory, attention, and concentration for Joshua (Participant 2). Both the Digit Span Forward and Digit Span Backward (WISC-IV; Wechsler, 2003) scores are charted as raw scores. The Digit Span Total scores are charted as scaled scores.



*Figure 16.* Pre-, post-, and follow-up treatment scores for the general reading achievement and comprehension (R-CBM; Shinn & Shinn, 2002a) for Joshua (Participant 2).



*Figure 17.* Pre-, post-, and follow-up treatment scores for general reading achievement and comprehension (MAZE; Shinn & Shinn 2002b) for Joshua (Participant 2).



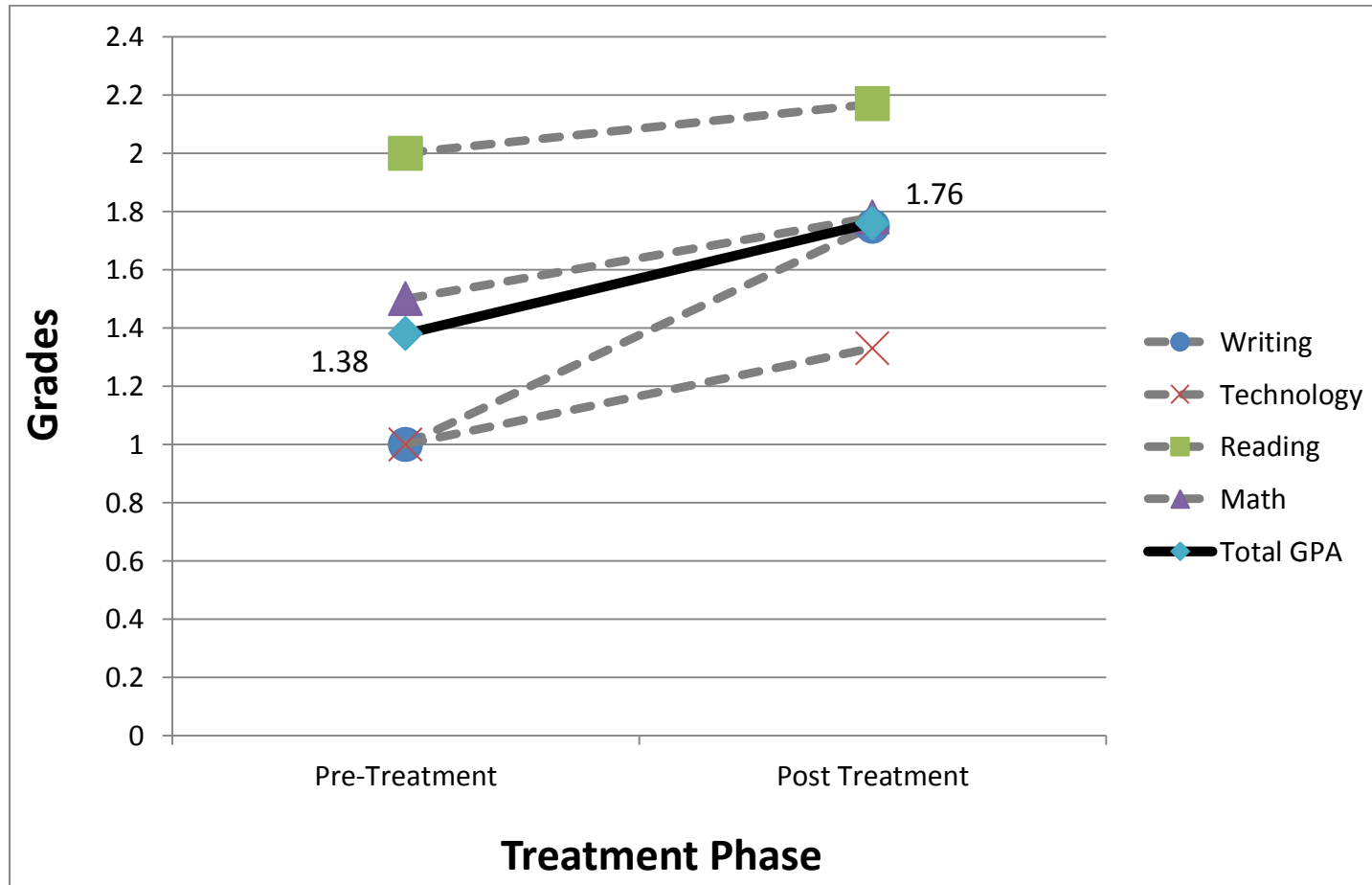


Figure 18. Pre- and post-treatment academic performance scores (Grades) for Joshua (Participant 2).

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