




Planned Dream Interventions: A Pragmatic Randomized Control Trial to Evaluate a Psychological Treatment for Traumatic Nightmares in UK Military Veterans

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ABSTRACT

Nightmares are a hallmark symptom of Post-Traumatic Stress Disorder (PTSD), affecting an estimated 90% of trauma-exposed adults. This article reports on a pragmatic randomized control trial to evaluate the effectiveness of an enhanced treatment approach called Planned Dream Interventions (PDI) compared with a standard sleep hygiene intervention. Ninety-two U.K. Armed Forces veterans completed self-report measures (sleep quality, nightmares, and PTSD) pre- and 1-month post-session. Large between group effect sizes (average $d = 1.1$) were noted across all measures. Overall, findings suggest that PDI is a safe, resource efficient and effective intervention, though further validation is required.

KEYWORDS

Traumatic nightmares; sleep disturbance; post-traumatic stress disorder (PTSD); veterans; nightmare rescripting; image rehearsal therapy (IRT); planned dream interventions (PDI)

Post-traumatic nightmares are a common feature of trauma, lead to poor sleep and can also exacerbate the symptoms of post-traumatic stress disorder (PTSD; Campbell & Germain, 2016). Nightmares can be defined as “vivid, realistic and disturbing dreams typically involving threats to survival or security, which often evoke emotions of anxiety, fear or terror” (American Academy of Sleep Medicine, 2014). A briefer definition that focuses on post-traumatic nightmares is that they are “vivid re-creations of painful events from the past” (Krakow & Neidhart, 1992). It is important to note there is considerable variation in the definition of nightmares, with debate around degree of awakening and presence of emotions other than fear (Campbell & Germain, 2016), as well as a distinction between post-traumatic nightmares and idiopathic ones. It is estimated that at least 90% of individuals who have a diagnosis of PTSD report nightmares related to traumatic events with a frequency than can be as often as 6 nights a week, and which may continue for 40–50 years after the original event (Hasler & Germain, 2009). Suicidal behaviors have also been shown to be higher in those experiencing traumatic nightmares (Littlewood, Gooding, Panagioti, & Kyle, 2016), which may endure following cognitive behavioral therapy (CBT) treatment for PTSD (Brownlow et al., 2016). The additional impact

of broken sleep is also significant, leading to both physical and mental health problems such as anxiety and depression, further exacerbating trauma symptoms (Walker, 2017).

Combat veterans are a distinctive population in that they have experienced traumatic events in numbers greater than the general population (Sundin, Forbes, Fear, Dandeker, & Wessely, 2011). Within the United Kingdom, they also experience considerable barriers accessing help for mental health problems, both whilst serving (Iversen et al., 2011) and also after they have left the Armed Forces (Ormerod, 2009). These include practical issues accessing services as well as stigma around mental health issues. Nightmares are not the only sleep disturbance experienced by veterans, with insomnia also cited as a significant problem (Pigeon, Campbell, Possemato, & Ouimette, 2013), which may be comorbid with nightmares. It has also been demonstrated that predeployment nightmares are associated with increased risk for the development of PTSD symptoms (Van Liempt, Van Zuiden, Westenberg, Super, & Vermetten, 2013). The extent to which disturbed sleep caused by nightmares is a core as opposed to a secondary symptom of PTSD was examined by Spoormaker and Montgomery (2008). Further research by Van Liempt (2012) postulated that disturbed sleep is both a

precipitating and perpetuating factor in PTSD symptomatology. Research linking how dreams and nightmares relate to psychological trauma at a neurocognitive level demonstrates that dreaming is an important function to help the brain to manage the consequences of exposure to trauma (Levin & Nielsen, 2007). Indeed it has been hypothesized that “chronic post-traumatic nightmares are failed attempts to adapt and recover from traumatic experiences” (Germain, 2013).

An important aspect of the phenomenology of post-traumatic nightmares is that they are not just bad dreams but evoke very high levels of emotion and often feature severe bodily symptoms such as sweating, shouting, fighting, and other gross body movements. These have shown to be more prevalent in veterans with combat experience (Van der Kolk, Blitz, Burr, Sherry, & Hartman, 1984) and constitute severe sleep disturbance. Symptoms such as these may attract separate diagnoses of REM sleep behavior disorder and breathing related sleep disorder (i.e. sleep apnea). However, this study does not delineate them as separate disorders but instead considers them as part of the symptomology of traumatic nightmares.

In summary, traumatic nightmares and associated sleep disturbance are a significant problem and evaluating interventions to treat them is therefore an important area for research.

Existing treatment approaches for nightmares

An early description of making rehearsed changes to nightmares was provided by Marks (1978), and several other clinicians, notably Krakow (Krakow, Kellner, Pathak, & Lambert, 1995), developed these approaches further as image rehearsal therapy (IRT) to treat nightmares. Nightmare rescripting, the main component of IRT, instructs clients to “end their dreams any way they want” and can be taught individually or in groups, though usually requires several sessions. However, IRT tends to be focused on a single recurring nightmare, and little guidance on what changes should be made are given, though a single trial (Thunker & Pietrowsky, 2012) developed this further to “change your dream until you can imagine to continue sleeping calmly.” Exposure, rescripting, and rehearsal therapy (ERRT; Davis & Wright, 2007) has developed this further to include identifying themes in the dream (e.g. control, safety) which need to be addressed by the rescript.

Over 20 controlled and uncontrolled trials have now been conducted, from 2001 (Krakow, et al.) to

the most recent in 2017 (Kunze, Arntz, Nexhmedin, Kindt, & Lancee, 2017). Four meta-analyses of these trials have also been completed (Augedal, Hansen, Kronhaug, Harvey, & Pallesen, 2013; Casement & Swanson, 2012; Hansen, Höfling, Kröner-Borowik, Stangier, & Steil, 2013; Yan-Yee Ho, Chan, & Nga-Sze Tang, 2016). In general, the evidence derived from these trials has shown that IRT and associated variants is an effective approach for resolving repetitive nightmares. However, a critical review of these studies (Harb et al., 2013) highlighted poor methodological quality and significant variation in trial results. Recommendations included improved definition and consistency of treatment delivery, more naturalistic participant cohorts and increased use of credible control conditions. One issue is that there is no single agreed treatment delivery, and several components are integrated together in different combinations such as: sleep hygiene; relaxation techniques; exposure; imagery rehearsal, and nightmare rescripting. Attempts to isolate which elements have the greatest impact through dismantling studies (Kunze et al., 2017; Pruiksma, Cranston, Rhudy, Micol, & Davis, 2018) have not produced any conclusive results.

Although most trials have demonstrated medium to large effect sizes, a 2010 study involving 124 Vietnam War veterans with chronic and severe PTSD (Cook et al., 2010) failed to show any significant impact. This was possibly due to the severe nature of participant symptoms and can be contrasted with more successful trials, where participants were civilians with idiopathic nightmares e.g. (Kunze et al., 2017; Cook et al., 2010) hypothesized that in the same way that psychotherapies for PTSD are less effective for complex and comorbid populations, the same may be true for nightmare treatments.

There is also a pharmacological treatment for nightmares called *Prazosin*, an alpha-1 adrenoceptor antagonist. This has been compared to psychological interventions such as IRT with outcomes that are broadly comparable (Germain et al., 2012). However, a recent trial involving 312 military veterans with chronic PTSD failed to show any impact (Raskind et al., 2018), and U.S. Veterans Administration (VA) have ceased to recommend this as a treatment for PTSD nightmares (Department of Veterans Affairs & Department of Defence, 2017).

To date, no comparable studies have been conducted with U.K. veterans, and although the research base for existing nightmare treatments is broad, the degree to which they are used in mainstream psychological treatment is unknown. Treatment is also

limited to repetitive replay dreams which in a small scale study of Australian veterans has been shown to make up only 45% of the population (Phelps, Forbes, Hopwood, & Creamer, 2011).

The planned dream intervention approach

The purpose of this research was to evaluate an approach to stopping traumatic nightmares for U.K. military veterans called planned dream interventions (PDI), which was originally conceived in 2001 by Dr Beverley Dexter, a U.S. military psychologist. Although she has used this approach extensively over several years with thousands of U.S. military personnel and veterans, results are anecdotal. The PDI approach involves attending a single 2.5-hr group session that teaches individuals how to stop their own nightmares by creating dream interventions when awake that enables the dream process to continue without interruption when asleep.

The initial part of the session (Dexter, 2010) provides a clear rationale for dreaming (“when bad things happen, we are supposed to dream about them”) and reframes nightmares as a “stuck dream” where the normal sleep cycle that includes rapid eye movement (REM) dream sleep has been interrupted (Cartwright, 2010, p. 130). Interpretation of dream content is discouraged, and participants are taught the importance of believing “there is no such thing as a bad dream” and that “anything can happen in a dream” (Dexter, 2010). Although PDI is similar to rescripting in that dream content can be influenced by conscious thoughts and imagery, the goal is not to rescript the whole of a selected nightmare, but instead to focus on what is happening at the point of waking up in the most *recent* dream. At this point, the participant asks themselves ‘what do I want to happen next that feels good at a *gut level*?’ (Dexter, 2010). The training focuses on the myriad of creative possibilities that can satisfy these requirements, such as introducing fantasy figures and reframing scenarios into something totally different that feels masterful. This dream intervention is brought to mind with associated positive emotions just before sleep, and its effectiveness is tested that night. If not fully successful (i.e., still waking up with disturbing dream content), a new intervention is created and the goal is to continue with this process until peaceful sleep ensues. The training emphasizes that the PDI is uncensored (i.e., that anything can happen in a dream, and that PDI may be violent, vengeful, or in bad taste), may not be the first idea thought of and must be similar to the “emotional volume” of the

“I was severely burned as a child and had frequent nightmares for many years. I would wake up during the part where the burn occurs, often screaming.”

“The dream intervention I used was that suddenly I was standing under a waterfall laughing, with water washing dirt off of me, which is what the burn had become.”

Dexter (2010)

Figure 1. Example of successful planned dream intervention.

dream at the point of waking. Nightmares that have perpetuated the symptoms of PTSD have now been transformed into dreams that allow traumatic memories to be reprocessed, perhaps through a process Hartmann refers to as “recontextualising emotion through imagery” (Hartmann, 2001, p. 119). The role of REM sleep in processing traumatic memories is discussed further by Kobayashi, Mellman, Altaee, Howell, and Lavela (2016).

The benefits from successful interventions and restful sleep include improvements to physical and mental health, and also reductions in the symptoms associated with PTSD such as flashbacks, avoidance behaviors, and hyperarousal (Germain, 2013). It should also be noted that PDI is very distinct from lucid dreaming, which is technique that teaches people to become conscious within their dreams (LaBerge, 1985), and requires significant practice to become proficient.

The resolution of persistent nightmares following a severe burning accident illustrates a successful PDI and is shown in Figure 1 (Dexter, 2010). The impact of the intervention was that peaceful sleep resulted after one night with no recollection of dreaming in the morning. It is important to note that a different intervention with the person running upstairs in a state of fear to jump in a cold shower (what they might have wanted to happen in real life) would not be effective because it probably wouldn’t feel good at a “gut level.”

Another important feature of the PDI approach is that if there is no clear dream recall but bodily symptoms are still present, then interventions can still be made. This aspect of disruptive nocturnal behavior without clear dream recall is absent from the literature, perhaps because it falls outside the standard definition of nightmares and are sometimes referred to as night terrors, with no clear treatment options. This, alongside other clear distinctions with existing nightmare treatments, is summarized in Figure 2.

Whereas recent research on existing nightmare treatments has focused on improving research methods and dismantling studies, there has been no innovation in fundamental treatment approaches.

Planned dream intervention	Image rehearsal therapy and variants
1. Taught as a single manualized 2.5hr class.	Manualized protocol for groups, and generally consists of 4-6 x 1 hour sessions.
2. Provides explanation for why we dream and have nightmares, and how the PDI can enable dream process to resume.	No specific explanation given of how IRT works. Participants may be less willing to engage in rescripting, especially if it involves elements of exposure (i.e. even writing out nightmare).
3. Provides clear guidelines on how to create interventions, and what to do if intervention not fully successful, with examples to illustrate key points.	General instruction is to 'end the dream any way you want'. Some formats include ending dream calmly and changing the situation. More practice is recommended if unsuccessful.
4. Assumption that 'there is no such thing as a bad dream' - goal is to sleep through any dream and not be disturbed.	Assumption that particular dream content is bad or unhealthy and must be stopped.
5. Does not require reciting or exposure to whole dream.	May requires exposure and rescripting of whole dream.
6. Can be applied to waking up with no dream recall and sleep disturbance/distressing emotions.	Requires that the client recall fixed dream content from repetitive dreams to enable it to be rescripted.
7. Learned skill that can be applied to present and future nightmares.	Learned skill but the focus is on a single selected nightmare from the present.
8. Goal is to end nightmares & disturbed sleep and to relearn to sleep peacefully through night.	Seen as a 'one nightmare at a time' approach.
9. No practice required other than bringing PDI to mind before sleep thinking 'this is what I want to appear in my dream'.	Requires daily practice of 10-20 minutes per day.

Figure 2. Comparison of planned dream intervention with image rehearsal therapy and variants.

This article reports on the first empirical investigation of the PDI approach with UK military veterans, which makes this research timely and relevant.

Method

Study design

A pragmatic randomized control trial (RCT) was conducted comparing outcomes from a single 2.5-hr PDI session with a sleep hygiene (SH) session of similar duration for U.K. veterans, using pre- and postmeasurement of sleep, nightmare, and PTSD symptoms to determine effects. SH was chosen as a control because it is the standard treatment for sleep disturbance within the United Kingdom and could be taught in an equivalent time period of 2.5 hours. A naturalistic cohort of U.K. veterans experiencing regular nightmares were recruited to attend sessions across the United Kingdom, with measures completed at baseline assessment (T0) and 1 month postsession (T1). The characteristics of a pragmatic RCT design are that it recognizes the real world complexity of both participants and interventions and provides flexibility in how research is conducted (Hotopf, 2002). This is

especially applicable to military veterans, who may present with a complex set of issues, and have to be managed remotely in a variety of settings. The assessments for this study were not intended to categorize and diagnose mental health disorders, but instead to assess the impact of these interventions on sleep, nightmares and trauma symptoms.

Ethical approval for this study was granted by the Anglia Ruskin University, alongside approval from the Research Committee of Help for Heroes (a veterans' charity), who provided help with recruitment and provision of facilities for sessions.

Sample size estimation

Selecting an appropriate effect size to model suitable sample sizes is vital to ensure an adequately powered trial. Basing calculations on a power rating of .8 at the 5% significance level, medium effect sizes ($d = .5$) would require 64 participants in each arm, whilst large effect sizes ($d = .8$) would only require 28 (Cohen, 1988). Previous meta-analysis (Augedal et al., 2013) have stated large overall effect sizes ($d = .74$). On this basis therefore, a very conservative $d = .5$ and corresponding sample size of 64 in each arm was

initially selected for this trial. With an assumed 25% drop out rate post-session, which was consistent with comparable studies (26%; Davis et al., 2011), approximately 160 participants were required to attend sessions.

Participants

Participants were U.K. military veterans experiencing traumatic nightmares at least weekly with, or without, a formal diagnosis of PTSD. Nightmares did not need to exclusively relate to military experiences, or even be based on real life events and, therefore, included idiopathic nightmares. This would also include those who experienced night terrors, which includes screaming and other bodily symptoms but with no clear recall of dream content. Exclusion criteria, based on self-report responses during telephone screening interviews, included those currently in trauma focused therapy, as this may have a confounding impact on nightmares and PTSD symptoms. Also excluded were those at higher risk who may not be suitable for attendance at a group event without in-depth screening due to, for example, a diagnosis of serious mental illness (e.g. personality disorder, psychosis, bipolar disorder), prescribed antipsychotic medication by a psychiatrist, and finally in current crisis with suicidal ideation or recent history of self-harm.

Procedures

Volunteers were recruited by email from the veteran's charity Help for Heroes Band of Brothers database, direct advertisement on social media and from charities providing managed veteran accommodation. Telephone screening determined eligibility and following remote completion of a data pack including consent forms, demographic information and self-report measures, participants were randomly assigned to sessions. These were held throughout the United Kingdom at four Help for Heroes Recovery Centres (Tidworth, Plymouth, Colchester and Catterick) as well as a Royal British Legion drop in center (Cardiff), AF&V Launchpad centers (Liverpool and Newcastle), Tom Harrison House (Liverpool), Scottish Veterans' Residences (Glasgow and Edinburgh), and Britannia Veterans Centre (Norwich).

Initial intentions had been to allocate participants randomly to either a PDI or SH group, but participant availability, session timing and geographical demands meant that randomization by location was more practicable. However, participants were always blind to the

type of session they were attending and consented to learn an approach to help improve sleep. A total of 27 sessions were held between April and November 2016, attended by 127 veterans, with group sizes varying from two to nine participants ($M = 5$). In addition, 47 veterans were not eligible to participate and 56 failed to attend a scheduled session. Because all participants were managed remotely and attended multiple locations across the United Kingdom, considerable difficulty was encountered in ensuring each arm of the trial was balanced. There was over recruitment in the PDI arm to allow for both nonattendance and subsequent loss to follow up, and once invited, there was an ethical requirement to deliver sessions.

The overall flow of participants through the study is shown in Figure 3, indicating that 62 and 30 participants, respectively, provided complete data for analysis from the PDI and SH groups. Participants were not compensated to attend sessions.

Measures

Outcome measures for sleep, nightmares, and PTSD symptoms were assessed using four self-report questionnaires that were administered pre- and postintervention. These included the Pittsburgh Sleep Quality Index (PSQI; Buysse, Reynolds, Monk, Berman, & Kupfer, 1989), which is a 19-item validated measure (scored 0–21) that assesses overall sleep quality in the past month generating seven component scores for subjective sleep quality, latency, duration, efficiency, disturbance, use of sleep medication, and daytime dysfunction. Overall, the measure has been shown to have good test-retest reliability ($r = .85$) and internal consistency (Cronbach's $\alpha = .83$), as well as good convergent and discriminant validity (Carpenter & Andrykowski, 1998).

The second measure was the Pittsburgh Sleep Quality Index PTSD Addendum (PSQI-A; Germain, Hall, Krakow, Shear, & Buysse, 2005), which is designed to assess the frequency of disruptive nocturnal behaviors that are common to adults with PTSD. The seven disruptive nocturnal behaviors include hot flashes (sweats); nervousness; trauma-related nightmares; other nightmares; panic; night terrors, and acting out in dreams. The PSQI-A is also scored on a 0–21 scale, and has been validated with a male U.S. military population and shown to have good internal consistency (Cronbach $\alpha = .72$) and convergent validity with sleep quality, combat exposure, PTSD symptoms, depression, and anxiety (Insana, Hall, Buysse, & Germain et al., 2013).

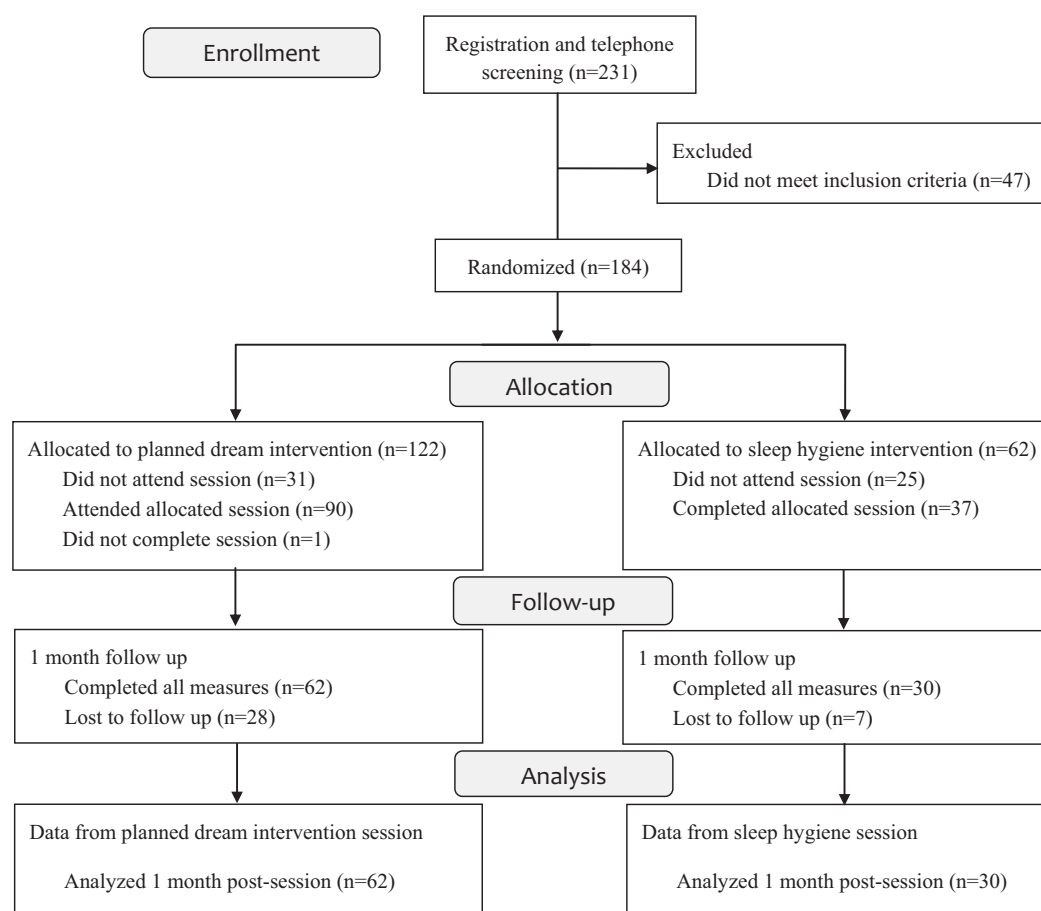


Figure 3. CONSORT diagram showing flow of trial participants.

The symptoms of psychological trauma and PTSD were assessed by using the Revised Impact of Event Scale (IES-R; Weiss & Marmar, 1997); a commonly used 22-item clinical tool yielding a score from 0 to 88. Questions relate to the three subsets of PTSD symptoms (hyperarousal, intrusiveness and avoidance), and a score >33 provides the best diagnostic accuracy for PTSD. This scale has been validated with male Vietnam veterans (Creamer, Bell, & Failla, 2003) and demonstrated good internal reliability (Cronbach $\alpha = .96$) and high correlation ($r = .84$) with the PTSD checklist (Weathers, Litz, Herman, Huska, & Keane, 1993).

The final measure was designed by the lead author to specifically focus on dreams, nightmares and their effects, with one key difference to other measures in that it doesn't assume dreams to be pathological i.e. a problem to be stopped. The aim was to provide a more holistic instrument that covered the effects of nightmares before, during, and after sleep. The Nightmare Assessment Scale (NAS) consists of seven questions scored on a Likert scale (0–4) yielding a total score of 0–28 and is shown in Figure 4.

Other more extensive measures for recording nightmares and their associated effects were available such as a sleep diary or the Trauma Related Nightmare Survey (Cranston, Miller, Davis, & Rhudy, 2017). However, these would all increase the burden on participants completing data collection remotely. Thus, a pragmatic decision was made to only use the four measures, which were a proxy for overall sleep quality, nightmares and trauma. Finally, a brief feedback questionnaire indicating overall acceptability and likelihood of putting techniques into practice was completed by participants at the end of each session.

Interventions

The PDI approach has been described earlier, and a more comprehensive account alongside its underpinning theory is detailed in Dr Dexter's teaching manual (2010). Key elements of this were translated into a Microsoft PowerPoint format to make it more replicable and suitable for U.K. veterans including two video case studies. The content of the PDI training was approved by Dr Dexter as being accurate to her theory and approach.

Nightmare Assessment Scale

Instructions: The following is a list of difficulties associated with nightmares. Please read each item, and then circle the appropriate number to indicate how often the difficulty has occurred **over the last 7 days**.

		Not at all	A little	Sometimes	Quite often	Frequently
1	How often have you avoided going to sleep because you feared having nightmares?	0	1	2	3	4
2	How often do you believe your sleep has been disrupted by nightmares?	0	1	2	3	4
3	How often do you feel a dream woke you up?	0	1	2	3	4
4	How often have you had episodes of "acting out" during your sleep, such as kicking, punching or screaming?	0	1	2	3	4
5	When you could remember it, how often was dream content disturbing to you?	0	1	2	3	4
6	How often were you unable to get back to sleep if woken by a nightmare in the middle of the night?	0	1	2	3	4
7	How often have nightmares and disrupted sleep had an impact your daytime functioning?	0	1	2	3	4

Figure 4. Nightmare Assessment Scale.

The main elements of the PDI session were:

1. Introduction and safety brief.
2. Explanation of why we dream, sleep cycles, REM sleep and reframing nightmares as “stuck” dreams.
3. Understanding the rationale for why “there is no such thing as a bad dream” and how interventions can enable dreams to continue uninterrupted.
4. How to create effective dream interventions and importance of emotional “gut feel.”
5. Examples of successful interventions used with different types of nightmare content.
6. Practical guidelines and troubleshooting hints and tips.

No disclosure of traumatic events or writing of nightmare content was required in the session, though participants were encouraged to individually create their own interventions before the end of the session and indicate this on feedback forms.

The SH session was based on standard components listed below (Morin et al., 2006), and the training material was reviewed by an independent Occupational Therapist at Help for Heroes. The 2.5 hour session consisted of:

1. Introduction and safety brief.
2. Impact of poor sleep on physical and mental health.
3. Facts about sleep and sleep cycles.
4. Psychoeducation about PTSD and nightmares.
5. How thoughts affect sleep and how they can be challenged.
6. Habits that interfere with, or enhance, sleep.
7. Relaxation techniques.

All sessions were delivered by the lead author due to resource constraints, using consistent materials throughout, though fidelity checks were limited to content, rather than the delivery of the session.

Table 1

Characteristic	Completers		Non-completers		Test statistics
	PDI (<i>n</i> = 62)	SH (<i>n</i> = 30)	DNA (<i>n</i> = 56)	LTFU (<i>n</i> = 35)	
Gender %:					$\chi^2 (3) = .504, p = .918$
Male	92%	93%	96%	91%	
Female	8%	7%	4%	9%	
Mean age (<i>SD</i>):	46.4(11.7)	44.7(9.9)	45.7(9.9)	45.8(10.8)	K-W $p = .977$
Current status %:					$\chi^2 (9) = 7.32, p = .604$
Employed	41%	33%	29%	26%	
Education	10%	7%	13%	3%	
Retired	15%	10%	16%	20%	
Other	34%	50%	42%	51%	
Military service %:					$\chi^2 (9) = 9.79, p = .368$
Army	71%	90%	92%	80%	
Royal Marines	5%	0%	0%	0%	
Royal Navy	13%	3%	4%	11%	
Royal Air Force	11%	7%	4%	9%	
Mean years since left military (<i>SD</i>)	12.7(11.4)	12.2(9.2)	14.4(9.3)	16.6(12.7)	K-W $p = .474$
Number active deployments %:					$\chi^2 (6) = 11.72, p = .068$
0 (e.g., U.K. or Germany)	5%	10%	0%	0%	
1	32%	40%	62%	51%	
2+	63%	50%	38%	49%	
PTSD diagnosis %:					$\chi^2 (3) = 0.740, p = .864$
Yes	65%	59%	67%	69%	
No	35%	41%	33%	31%	
Mean years since PTSD diagnosis (<i>SD</i>)	5.6(5.9)	6.4(8.9)	5.9(4.8)	7.5(6.8)	K-W $p = .445$
Previous trauma treatment %:					$\chi^2 (3) = 1.572, p = .666$
Yes	43%	30%	42%	43%	
No	57%	70%	58%	57%	
Mental health medication %:					$\chi^2 (6) = 10.204, p = .116$
Yes	65%	53%	83%	63%	
No	35%	47%	17%	37%	
Mean years suffered nightmares (<i>SD</i>)	14.4(11.4)	12.9(9.3)	15.6(10.0)	14.1(10.9)	K-W $p = .815$
Mean Initial Scores at T0 (<i>SD</i>)					
PSQI/21	15.4(3.5)	15.7(2.8)	17.2(2.2)	16.1(2.7)	K-W $p = .122$
PSQI-A/21	11.7(4.9)	12.4(3.8)	13.8(5.1)	14.3(4.5)	K-W $p = .047$
IES/88	51(20.3)	55.2(19.6)	61.8(18.8)	55.7(20.8)	K-W $p = .126$
NAS/28	17.1(6.4)	19.0 (4.9)	19.8(5.9)	19.4(7.3)	K-W $p = .141$

Note. PDI = planned dream intervention; SH = sleep hygiene; DNA = did not attend (session); LTFU = lost to follow-up (1 month post session); PSQI = Pittsburgh Sleep Quality Index; PSQI-A = Pittsburgh Sleep Quality Index PTSD Addendum; IES-R = Impact of Events Scale Revised; NAS = Nightmare Assessment Scale; K-W = Kruskal-Wallis non-parametric test.

Data analysis

Statistical Package for Social Sciences (SPSS: version 20) was used for all statistical analysis with a two tailed alpha level of .05. Preliminary analysis of baseline data to check consistency between groups was conducted using chi-square tests (χ^2) for categorical variables and Kruskal-Wallis nonparametric tests for continuous variables (i.e. age) as tests for normality were not substantiated. Those who failed to attend sessions, or who were lost to follow up later on, were also analyzed to determine whether any variation in baseline characteristics could account for dropout. The internal consistency (Cronbach α) for each of the three measures was also calculated.

A repeated measure analysis of variance (ANOVA) was conducted to determine whether there was a statistically significant difference in the outcome measures at T0 and T1 between the PDI and SH groups. Only participants with complete pre- and postdata for all measures were included in the analysis and

preliminary tests to check normality, homogeneity of variance and sphericity were carried out. Within and between group effect sizes were calculated using Cohen's d where d = the difference in the two means divided by the pooled standard deviation. Cohen (1988) defined effects as small (.2), medium (.5), and large (.8) respectively. In addition, limited data from the PDI group ($n = 25$) who completed measures 3 months postsession was available and analyzed to determine durability of PDI gains.

Results

Participant characteristics

Table 1 details the demographic and clinical characteristics of those that completed sessions (PDI and SH groups) and those that did not attend (DNA) or were lost to follow-up (LTFU) postsession (i.e. non-completers).

Table 2. Observed means, standard deviations, within and between group effect sizes and results of repeated measures analyses of variance (ANOVA) at baseline and 1 month postsession.

Outcome measure	Group	Baseline T ₀		1 Month Post T ₁		Within group effect size <i>d</i>	Between group effect size <i>d</i>	ANOVA: Time × Group interaction between T ₀ and T ₁
		Mean	SD	M	SD			
PSQI/21	PDI	15.4	3.5	11.1	4.8	1.02	1.46	W-L = .829, F(1,90) = 18.6, <i>p</i> < .001
PSQI-A/21	SH	15.7	2.8	14.9	3.9	0.23	1.13	W-L = .829, F(1,90) = 18.5, <i>p</i> < .001
	PDI	11.7	4.9	7.7	4.8	0.84		
IES-R/88	SH	12.4	3.8	12.5	4.6	0.05	0.86	W-L = .861, F(1,90) = 14.3, <i>p</i> < .001
	PDI	51.0	20.3	34.5	22.1	0.78		
NAS/28	SH	55.2	19.6	52.1	22.7	0.26	1.04	W-L = .790, F(1,90) = 15.06, <i>p</i> < .001
	PDI	17.1	6.3	10.6	7.2	0.96		
	SH	19.0	4.9	18.3	7.0	0.13		

Note. PDI = planned dream intervention (n = 62); SH = sleep hygiene (n = 30); PSQI = Pittsburgh Sleep Quality Index; PSQI-A = Pittsburgh Sleep Quality Index PTSD Addendum; IES-R = Impact of Events Scale Revised; NAS = Nightmare Assessment Scale; W-L = Wilk's Lambda;
 Calculations: $d_{\text{within group}} = (M_{T0} - M_{T1}) / \sqrt{((SD_{T0}^2 + SD_{T1}^2) / 2)}$
 $d_{\text{between group}} = (M_{\text{PDI diff}} - M_{\text{SH diff}}) / \sqrt{((SD_{\text{PDI diff}}^2 + SD_{\text{SH diff}}^2) / 2)}$ where PDI diff = difference in scores between T₀ and T₁ for PDI group.

Overall, most completers were males (93%) who had served in the British Army (80%), with an average age of 45.6 years old (*SD* = 10.6) ranging from 27 to 80 years. Over half (57%) had deployed more than once to active theaters and had left the military on average 12.5 years (*SD* = 10.7) previously. Sixty-two percent had a formal diagnosis of PTSD, 37% had received some form of trauma specific therapy, and 59% were prescribed some form of mental health medication. Eighty-three percent had an IES-R score >33, which has been shown to correlate strongly with a diagnosis of PTSD. On average, they had suffered nightmares for 13.7 years (*SD* = 10.4) with 34% of participants dream content based completely on real events, 20% of purely fictitious content and 28% mixed. A further 18% had no clear dream recall but reported bodily symptoms and sleep disturbance.

The statistical analysis of baseline characteristics is also shown in Table 1 and demonstrates there was no significant variation (*p* > .05) between the four groups except for initial PSQI-A scores (*p* = .047). The Cronbach test for internal consistency for all outcome measures produced scores α > .7, which is the accepted threshold for this test (Field, 2013).

Outcomes

No adverse incidents were reported during the trial, and only one veteran left a PDI session citing that “it

wasn't for him.” Feedback forms completed at the end of the PDI session were positive even for those who were not ultimately successful in its use, and 76% of participants left a session with an idea for their own intervention. SH sessions were also seen as providing useful information, some of which was already known to participants. Collecting data after the intervention was problematic, and high dropout rates were observed especially for the PDI group. There was no indication on feedback forms that indicated likelihood of dropping out, but there were difficulties maintaining contact and getting self-report questionnaires completed remotely.

The primary outcome analysis compared baseline and post-session scores for the PDI and SH groups and is shown in Table 2. The mean change across all four measures in the PDI group was significantly greater than the SH group. Within group effect sizes (*d*) for the entire PDI group for all four measures ranged from 0.78 to 1.02 (large), compared to 0.05–0.26 (small) for the SH group. Between group effects sizes were all large ranging from 0.86 to 1.46. The results from the ANOVA demonstrated a statistically significant main effect for the Time × Group interaction for the PDI group for each of the four measures.

There was also considerable variation of outcomes within the PDI group, from 19 out of 62 reporting a clinically significant reduction in PTSD symptoms at

T1 (IES <33), to 3 participants reporting slightly worse scores at T1. The additional data collected 3 months postintervention from 25 participants in the PDI group indicated a further reduction in observed mean scores across all measures and large effect sizes ($d = 1.11\text{--}1.24$), though this data must be viewed cautiously. It is likely that those that responded were more likely to have found PDI effective which would skew results, and there is no comparison with the SH group.

Discussion

This is the first pragmatic RCT using the PDI approach with U.K. military veterans. Outcome data indicated statistically significant results for the PDI group compared to the SH group, with improvement across all measures representing overall sleep quality, nightmares and trauma symptoms. The improvements were also sustained 3 months post intervention, albeit with a smaller sample size and no corresponding SH data, providing some additional support for the intervention.

These results compare favorably with existing treatments though direct comparisons with other trials must consider the impact on different populations. Kunze et al. (2017) reported high effect sizes across a broad range of measures for those suffering idiopathic nightmares, though only 18% were prescribed medication for mental health, compared to 59% in this study. Van Schagen, Lancee, de Groot, Spoormaker, and van den Bout (2015) only reported medium effect sizes, but with a diverse psychiatric population including those with personality disorder who were excluded from this study. Trials involving U.S. military reported a mix of effect sizes from small (Cook et al., 2010) to large (Long et al., 2011) though these consisted of six treatment sessions and additional nightmare exposure compared to three in the Kunze trial. PDI demonstrated large effect size for a diverse population of U.K. veterans with nightmares and sleep disturbance after a single 2.5-hr session. To put these results in context, reduction in mean IES-R score from 51.0 to 34.5 (T0–T1) for PDI compare favorably with the Combat Stress 6-week intensive therapy program (Murphy et al., 2015), which achieved a reduction of 56.4 to 41.1 on the same measure.

The PDI approach would hypothesize that the creation of an appropriate intervention and the associated strength of the mastery/positive emotion is of prime importance. This is more significant than whether the PDI is logical or fits coherently into the

dream narrative, which tends to be emphasized in traditional nightmare rescripting. This is highlighted by the description of an existing treatment where a successful idea for a dream revision would often be accompanied by a smile on the dreamer's face (Dow, 2015, p. 15). The PDI approach elevates the importance of the “good gut feel” attached to the intervention and the importance of working on most recent dream content, and the session focuses on how this can be achieved in practice. This is also a possible explanation for some of the variation in outcomes of previous studies, which is potentially linked to the quality of the rescript at the critical point of the dream where the participant is woken up, and also the nightmare selected to work on. For example, in one trial of IRT (Cook et al., 2010) that didn't show any significant effect for rescripting, it was later reported that 87% of the dream changes were predominantly realistic (Harb, Thompson, Ross, & Cook, 2012), and therefore possibly less effective as interventions.

One of the limitations of existing nightmare treatments is that they are only applicable to repetitive nightmares. Individuals with “jumbled up dreams,” and those with no clear dream recall but significant bodily symptoms (i.e., shouting, sweating, fighting) represents a significant population where the PDI approach can still be utilized. Twenty-six percent of the “completer” PDI group reported “no recall dreams” compared to 18% in the trial population, with results spread evenly across the group.

Another important difference between PDI and existing nightmare treatments (especially exposure) is that participants do not need to talk explicitly about their trauma or nightmare content during the session, which increases attractiveness of this approach to veterans. The version of IRT with the least amount of exposure (Krakow et al., 2001) still requires participants to write out their target nightmare, which may be potentially triggering and unpleasant for some. The PDI approach is also taught in a single session and therefore dropout between sessions, which has been reported as high as 36% in an IRT trial of combat veterans (Cook et al., 2010) is another benefit over existing treatments, as well as improved cost effectiveness. Although there was a 31% drop out from the PDI group postsession, this is more likely to be linked to difficulties of remote follow-up, complexities associated with the veteran population and other life issues, rather than the PDI approach itself. For example, some participants lost accommodation after the session, and others who were difficult to contact reported

improvements to sleep. Feedback forms completed at the end of the session demonstrated the PDI intervention was acceptable and no adverse comments were received that indicated likelihood of dropout. As previously stated, analysis of the DNA and LTFU group (i.e., the non-completers) did not show any significant difference in demographic or clinical characteristics, even when divided into SH and PDI subgroups. One possible explanation for the reduced level of dropout from the SH group was that some of these sessions were run in veterans' residences where postsession responses were easier to elicit.

Although other studies have showed the effectiveness of SH components in dismantling trials (Pruiksma et al., 2018), a possible explanation for the lack of efficacy in this trial was the limited dose from a single session—it is usually taught over several sessions with supervised practice. Overall, the PDI approach has low resource requirements compared to existing treatments, which makes it more cost effective and suitable as a group stabilization intervention to improve sleep and reduce trauma symptoms, which may be sufficient on its own, or as a precursor to further trauma therapy.

Strengths and weaknesses

Strengths of this research include the relatively large sample size (large effect sizes, as demonstrated, only required 28 participants in each arm of study) and participation by a wide cross-section of veterans. The treatment approaches were manualized, though a significant limitation was that for pragmatic reasons, the lead author conducted all elements of the study from screening and collating questionnaires, to conducting sessions and follow-up. Although this was an unavoidable source of expectancy bias, the follow-up was remote and the author had no ongoing relationship with participants.

All of the analyses were based on complete participant data, and there was no reliance on deriving outcome data for intent-to-treat (ITT) analysis. Although ITT increases internal validity, it does so at the cost of completing missing data using methods such as "last observation carried forward." Although numbers of noncompleters in the DNA/LTFU groups were high, their demographic and clinical characteristics were not significantly different to treatment completers, indicating group consistency. The benefits of a more naturalistic sample and variety of session settings were offset by having to randomize by location and unbalanced trial arms. Although some RCT trials

of IRT have used a broader set of measures and used more detailed data recording included sleep diaries and clinical interviews to assess PTSD symptoms, remote completion of self-report questionnaires meant that a more pragmatic approach to data collection was required.

Conclusions

Overall, this research has demonstrated the utility and effectiveness of the PDI approach as taught to U.K. veterans in a single 2.5-hr group session. It provides a stabilization intervention that can help alleviate the effects of poor sleep from nightmares, is safe, resource/cost efficient and acceptable to this target population. Assuming that further research supports the current conclusions, it appears that the PDI approach has significant clinical potential, especially in the current climate in which psychological trauma is being more frequently diagnosed and that global healthcare resources are increasingly scarce. Further research should focus on creating more stable trial conditions, replicating outcomes with multiple intervention providers investigating factors that impact outcomes with PDI and longer follow-up to ensure that therapeutic improvements are maintained.

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