Imagery Rehearsal Therapy for Chronic Nightmares in Sexual Assault Survivors With Posttraumatic Stress Disorder

A Randomized Controlled Trial

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Context Chronic nightmares occur frequently in patients with posttraumatic stress disorder (PTSD) but are not usually a primary target of treatment.

Objective To determine if treating chronic nightmares with imagery rehearsal therapy (IRT) reduces the frequency of disturbing dreams, improves sleep quality, and decreases PTSD symptom severity.

Design, Setting, and Participants Randomized controlled trial conducted from 1995 to 1999 among 168 women in New Mexico; 95% had moderate-to-severe PTSD, 97% had experienced rape or other sexual assault, 77% reported life-threatening sexual assault, and 58% reported repeated exposure to sexual abuse in childhood or adolescence.

Intervention Participants were randomized to receive treatment (n=88) or to the wait-list control group (n=80). The treatment group received IRT in 3 sessions; controls received no additional intervention, but continued any ongoing treatment.

Main Outcome Measures Scores on the Nightmare Frequency Questionnaire (NFQ), Pittsburgh Sleep Quality Index (PSQI), PTSD Symptom Scale (PSS), and Clinician-Administered PTSD Scale (CAPS) at 3- and 6-month follow-up.

Results A total of 114 participants completed follow-up at 3 and/or 6 months. Comparing baseline to follow-up (n=97-114), treatment significantly reduced nights per week with nightmares (Cohen d=1.24; $P<.001$) and number of nightmares per week (Cohen d=0.85; $P<.001$) on the NFQ and improved sleep (on the PSQI, Cohen d=0.67; $P<.001$) and PTSD symptoms (on the PSS, Cohen d=1.00; $P<.001$ and on the CAPS, Cohen d=1.53; $P<.001$). Control participants showed small, nonsignificant improvements for the same measures (mean Cohen d=0.21). In a 3-point analysis (n=66-77), improvements occurred in the treatment group at 3-month follow-up (treatment vs control group, Cohen d=1.15 vs 0.07 for nights per week with nightmares; 0.95 vs −0.06 for nightmares per week; 0.77 vs 0.31 on the PSQI, and 1.06 vs 0.31 on the PSS) and were sustained without further intervention or contact between 3 and 6 months. An intent-to-treat analysis (n=168) confirmed significant differences between treatment and control groups for nightmares, sleep, and PTSD (all $P<.02$) with moderate effect sizes for treatment (mean Cohen d=0.60) and small effect sizes for controls (mean Cohen d=0.14). Posttraumatic stress symptoms decreased by at least 1 level of clinical severity in 65% of the treatment group compared with symptoms worsening or not changing in 69% of controls (χ^2_1=12.80; $P<.001$).

Conclusions Imagery rehearsal therapy is a brief, well-tolerated treatment that appears to decrease chronic nightmares, improve sleep quality, and decrease PTSD symptom severity.

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Nielsen and Zadra[1] recently estimated that "4 to 8% of the general population have a 'current problem' with nightmares." Frequent nightmares are also reported in depression,[2] schizophrenia-spectrum disorders,[3] and in posttraumatic stress disorder (PTSD) where a prevalence of 60% has been documented.[4] Paradoxically, *The International Classification of Sleep Disorders*[5] lists a prevalence of "perhaps 1%," whereas the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR)* mentions that at least

See also p 584.

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3% of young adults report frequent nightmares, but concludes that "actual prevalence of Nightmare Disorder is unknown."[6] These disparities in prevalence estimates occur because nightmare epidemiological research usually surveys disturbing dream frequency without inquiring about comorbid conditions,[7-9] whereas the *DSM-IV-TR* states that nightmares occurring with another psychiatric disorder precludes a nightmare disorder diagnosis.[6] This latter and prevailing view of disturbing dreams holds that nightmares are secondary to another disorder, such as anxiety or PTSD.[5,6,10] While this view has nosological support, it suggests that nightmares are not a distinctly treatable condition and that remission occurs only through treatment of the primary disorder. For example, if nightmares were attributed to posttraumatic stress, it seems logical to focus treatment efforts on PTSD, which ought to reduce bad dreams, distress, and impairment.[11]

In contrast, evidence shows that disturbing dreams are associated with psychological distress[12-14] and sleep impairment.[15,16] Moderate-to-large correlations between nightmares and anxiety, depression, and PTSD have been reported.[13,14,17] Nightmares disrupt sleep, producing conditioning patterns similar to classic psychophysiological insomnia along with a specific complaint of "fear of going to sleep."[12,15,16] Prospective treatment studies of brief cognitive-behavioral techniques, including desensitization and imagery rehearsal, which solely targeted disturbing dreams in nightmare sufferers without comorbid psychiatric disorders, demonstrated large reductions in nightmares.[18-22] In some studies, decreased nightmares were associated with decreased anxiety[20,21] and improvements in sleep.[22] In a preliminary report on nightmare treatment in PTSD patients, disturbing dreams and posttraumatic stress severity decreased and sleep quality improved with imagery rehearsal therapy (IRT).[23]

Wile[24] reported the first case series in which an imagery technique was used in the treatment of nightmares. Several reports have appeared since[25]; most notably, Marks[26] theorized that rehearsal of nightmares provides therapeutic benefits through "exposure, abreaction, and mastery," but Bishay[27] suggested that exposure and abreaction were secondary to mastery because he observed that changing the storyline of the disturbing dream was more effective for the patient than rehearsal of the original dream. Early in our work with nightmare sufferers, we observed that mastery was pivotal in the resolution of chronic nightmares. Kellner et al[28] raised the issue of whether IRT would be effective in treating severe, chronic nightmares in patients with comorbid psychiatric disorders, such as PTSD, particularly rape survivors who frequently suffer severe nightmare disturbances.[4,29] We also speculated that sexual assault survivors might be receptive to IRT because of its focus on dreams and sleep and its deemphasis on exposure to past traumatic events.

We therefore conducted a prospective randomized controlled trial of IRT in a sample predominantly consisting of sexual assault survivors with PTSD to assess treatment effects of targeted nightmare therapy on nightmares, sleep, and posttraumatic stress. We hypothesized that sexual assault survivors treated with IRT would report fewer nightmares, improved sleep quality, and decreased distress compared with a wait-list control group.

METHODS

Study Population

The study was approved by the University of New Mexico Health Sciences Center institutional review board. Eligible participants were female sexual assault survivors, 18 years or older, with self-reported nightmares, insomnia, and posttraumatic stress symptoms coupled with a criterion A trauma link.[6] Women with acute intoxication, withdrawal, or psychosis were excluded. Participants were recruited from media efforts (35% of sample), mental health therapists and facilities (36%), rape crisis centers (17%), and other resources (10%) from 1995 to 1999. After being given a complete description of the study, participants provided oral and written consent. Personal interviews and psychometric instruments were offered to 203 potential participants. At intake, 79% of participants were concurrently receiving psychotherapy (primarily counseling) and/or psychotropic medications (primarily tricyclic antidepressants or selective serotonin reuptake inhibitors).

Randomization and Blinding Procedures

To mask treatment assignment, patients mailed back a postcard after intake to complete entry into the protocol. The postcard's time and date were logged into a computer and entered into a previously generated list of numbers that randomly assigned participants to treatment and control groups. All numbers and group assignments were generated at the start of the protocol. Randomization of 168 women produced 2 groups: treatment (n=88) and wait-list control (n=80) (χ^2=0.38, P=.54) (FIGURE 1). Of 35 women who did not participate, 29 did not complete full intake packets and 6 did not return postcards. Due to the wait-list design, blinding was not possible for delivery of treatment. To limit external bias, blinding occurred at 3 points of data collection: (1) at intake, group assignment had not been established; (2) at 3-month follow-up, questionnaires were completed through the mail; and (3) at 6-month follow-up, interviewers were unaware of group status.

Measurements

Primary outcome measures consisted of 5 variables assessed by self-report with validated, standardized questionnaires completed at intake and follow-ups. The Nightmare Frequency Questionnaire (NFQ) assesses "nights with nightmares" per unit of time (eg, per week, per month) and actual "number of nightmares." Test-retest reliability produced weighted κ of 0.85 to 0.90, and concurrent validity was established with a mean correlation coefficient of 0.38 (r=0.28-0.49) with measures of anxiety, depression, and

PTSD.[17] The Pittsburgh Sleep Quality Index (PSQI) assesses sleep quality and disturbances during the past month based on 7 component scores for sleep quality, latency, duration, efficiency, disturbance, medication use, and daytime dysfunction that sum to a global score (range, 0-21).[30] The Clinician-Administered PTSD Scale (CAPS) measures frequency and intensity of PTSD-related symptoms for the preceding month (range, 0-136).[31] The PTSD Symptom Scale (PSS) measures PTSD symptoms according to *Diagnostic and Statistical Manual of Mental Disorders, Revised Third Edition* (*DSM-III-R*) criteria to evaluate the severity of intrusion, avoidance, and arousal symptoms and sums these scales for total severity in the preceding 2-week period (range, 0-51).[32] Higher scores reflect greater severity on each measure.

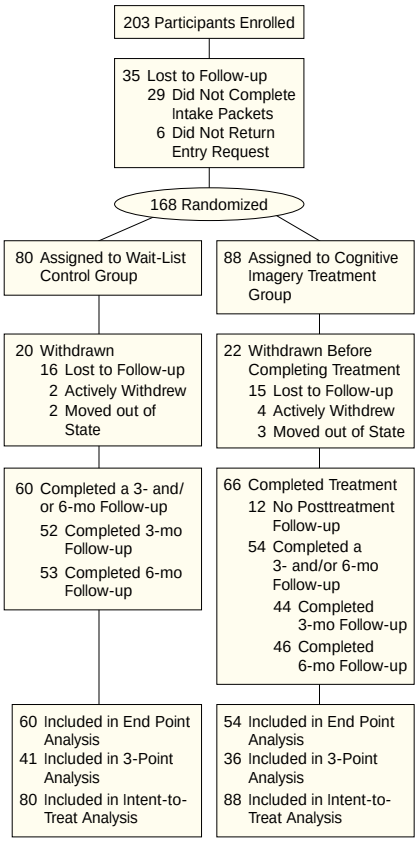
Secondary measures included the following: Nightmare Effects Survey (NES) (impairment associated with nightmares),[23] Nightmare Distress Questionnaire (NDQ) (distress associated with nightmares),[33] Pittsburgh Sleep Quality Index-Addendum (PSQI-A) (PTSD-related sleep symptoms),[30] Hamilton Anxiety and Depression scales,[34,35] Sheehan Disability Inventory (SDI) (daily functioning),[36] and the SF-36 (physical and mental health functioning).[37] Information was also collected on baseline history of past traumatic events and baseline and follow-up use of antidepressants, anxiolytic/hypnotics, and concurrent psychotherapy. The NFQ, PSQI, and PSS measures were administered at 3 points in the study; all other measures were administered at baseline and 6-month follow-up.

Treatment

Treatment consisted of 3 sessions (two 3-hour sessions spaced 1 week apart with a 1-hour follow-up 3 weeks later) using a cognitive-imagery treatment,[23] presented in groups (led primarily by B.K. and a few by L.C. [which were observed and supervised by B.K.]). The treatment protocol followed a manual and focused on nightmares within the framework of an imagery and cognitive restructuring paradigm. Treatment assumptions conveyed to the patients were as follows: (1) nightmares may be caused by uncontrollable and traumatic events, yet may serve a beneficial purpose immediately following trauma by providing information and emotional processing; (2) nightmares persisting for months may no longer serve useful purposes and may be viewed more pragmatically as a sleep disorder; (3) nightmares may be successfully controlled by targeting them as habits or learned behaviors; (4) working with waking imagery influences nightmares because things thought about during the day are related to things dreamed about at night; (5) nightmares can be changed into positive, new imagery; and (6) rehearsing new imagery ("new dream") while awake reduces or eliminates nightmares, without requiring changes on each and every nightmare. Groups of 4 to 8 women were formed, and treatment was provided on average every month to every other month based on recruitment.

In the first session of IRT, participants are encouraged to examine 2 contrasting views of nightmares: nightmares as a function only of traumatic exposure vs nightmares as a function of both trauma and learned behaviors. Participants are asked to explore the possibility that although nightmares may be trauma-induced, they may also be habit-sustained. At the end of the first session, participants practice pleasant imagery exercises, learn cognitive-behavioral tools for dealing with unpleasant images that might emerge, and are asked to practice pleasant imagery. At the second session, imagery practice is discussed and any difficulties addressed. Then, participants learn how to use IRT on a single, self-selected nightmare. The participant writes down her disturbing dream, then per a model devised by Neidhardt et al,[21] is instructed to "change the nightmare anyway you wish" and to write down the changed dream. Afterward, each participant uses imagery to rehearse her own "new dream" scenario for 10 to 15 minutes. Next, she briefly describes her old nightmare and how she changed it, both in her written attempt and, if applicable, during the actual rehearsal process. After this initial exercise, participants are encouraged to not write down the old nightmare or the changed version but to establish the process mentally. They are instructed to rehearse a new dream for at least 5 to 20 minutes per day but never to work on more than 2 distinct "new dreams" during each week. Descriptions of traumatic experiences and traumatic content of nightmares are discouraged throughout the program in a carefully designed attempt to minimize direct exposure. To facilitate this approach, participants are instructed to work first with a nightmare of lesser intensity and, if possible, one that does not seem like a "replay" or a "reenactment" of a trauma. In 3 weeks, the group meets for a 1-hour session to discuss progress, share experiences, and ask questions about nightmares, sleep, and PTSD and how

Figure 1. Study Flow Chart



IRT might be useful for other symptoms in addition to nightmares.

Follow-up

Treatment and control participants were mailed a follow-up packet of questionnaires at 3 months and invited to a personal interview at 6 months. Of the 168 randomized participants, 96 completed 3-month follow-ups by mail, and 99 completed the 6-month follow-ups in person. In total, 114 individuals completed at least 1 follow-up, and 77 participants completed both follow-ups. Most noncompleters were lost to follow-up early in the program, usually within 1 month of randomization. However, 12 completed treatment sessions and then were lost to follow-up (Figure 1). Contact with control participants was limited to brief telephone calls and letters to remind them of future appointments. All participants were asked to complete a 5-item questionnaire about potential suicidality at baseline and follow-ups. A few patients reported acute distress and were referred for crisis intervention. All controls continued any treatment they were already receiving and were offered treatment at no charge on completion of their 6-month wait-list period.

Data Analysis

Ethnicity, marital status, income, and education were each condensed into 2 categories due to sparse cells. Comparison of baseline data on main outcome measures for nightmares, sleep, and PTSD and demographics for treatment vs control groups by completers (at end point: completed either 3- or 6-month follow-up) and noncompleters were analyzed using analysis of variance (ANOVA) and χ^2 test. Although patients were individually randomized, treatment was conducted in small groups, and therefore effects may have correlated with group membership; thus, grouping effects on treatment for all main outcome variables were initially analyzed with random effects regression[38] using PROC MIXED in SAS.[39] Because no grouping effects approached significance (all $P>.90$), repeated measures ANOVA was the primary analytic procedure reported in this study. Treatment efficacy analyses assessed the following: (1) end point (n=97-114, changes from baseline to end point based on last follow-up, 3 or 6 month, observation carried-forward analysis); (2) 3 points (n=66-77, changes from baseline to 3-month to 6-month follow-up); and, (3) intent-to-treat (n=168, changes in baseline to last observation, including baseline, carried-forward analysis, ie, all randomized individuals).

To test whether moderator variables influenced treatment effects, repeated-measures ANOVAs were conducted on the main outcome variables using each potential moderator as an additional between-subjects independent variable in a treatment × time × moderator design. The moderators tested were antidepressant use, anxiolytic/hypnotic use, concurrent psychotherapy, number of potentially life-threatening sexual assaults ("high magnitude"), or repeated exposure to sexual abuse. Repeated measures ANOVAs were also conducted on secondary measures between baseline and 6 months. All tests used the .05 level of significance and effect sizes were reported as Cohen *d*, the standardized mean difference.

RESULTS

Demographic and Clinical Characteristics

A total of 168 participants were randomized into control and treatment groups and were compared based on follow-up status: control completers (n=60), treatment completers (n=54), control noncompleters (n=20), and treatment noncompleters (n=34). There was no significant difference for lost to follow-up rates between control and treatment noncompleters (Fisher exact test, $P=.07$). No significant baseline differences were found between groups with the exception of age ($P=.01$), whereby control noncompleters were younger than treatment completers (TABLE 1). No significant baseline differences among the 4 groups for main outcome variables were found (TABLE 2). No significant differences between groups for concurrent psychotherapy and anxiolytic/hypnotic use at baseline were detected, but control noncompleters' concurrent use of antidepressants was significantly less than use by other groups at baseline ($P=.03$) (TABLE 3). No significant differences were found for frequency of traumatic exposures documented at baseline interviews (Table 3).

Eighty-three percent of participants reported clinically meaningful posttraumatic stress severity on the CAPS (score ≥65),[31] and 95% reported moderate or worse posttraumatic stress severity on the PSS (score ≥11), all of whom met *DSM-III-R* diagnostic criteria for PTSD.[32] The remaining 5% (n=8) experienced mild posttraumatic stress. Nightmare chronicity was not significantly different between the 2 groups (treatment: mean [SD] of 21.8 [15.3] years vs control: 19.3 [13.7] years). Ninety percent experienced sexual, physical, or emotional abuse as children, with sexual abuse the most frequently reported. Fifty-eight percent reported repeated exposure to sexual abuse for an average period of 8 years, among whom 72% were 10 years old or younger when this abuse first occurred. Seventy-seven percent reported high-magnitude sexual assaults during their lifetime, among whom 48% experienced 2 or more such events. Three participants who were exposed to violent, nonsexual assaults were retained in the protocol and analysis because their baseline data were similar to the sexual assault survivors.

Treatment Efficacy

Treatment × time interaction effects were found with a substantial decrease in nightmares, sleep, and PTSD scores at end point for the treatment group but only small changes, on average, for the control group (TABLE 4). Treatment group improvements were large for nights per week ($d=1.24$), nightmares per week ($d=0.85$), PSQI ($d=0.67$), PSS ($d=1.00$), and CAPS ($d=1.53$). For the main outcome mea-

sures, mean treatment $d=1.06$. By contrast, control participants showed small nonsignificant changes in nights ($d=0.20$) and nightmares ($d=-0.12$) per week, PSQI ($d=0.13$), and PSS ($d=0.29$), but moderate improvement for CAPS ($d=0.53$, $P=.001$). Mean control $d=0.21$. Both nightmare frequency and PTSD symptoms showed a consistent pattern of decreasing clinical severity levels compared with controls (PTSD scores were based on the Foa[40] scoring system for the newer Posttraumatic Stress Diagnostic Scale, which yields the same total range of 0-51 as the PSS) (TABLE 5).

To assess maintenance of treatment effect over time, main outcome variables were analyzed for 77 women who completed baseline, 3-month, and 6-month nightmare follow-ups. Mean differences across 3 points were statistically significant for nights per week ($F_{2,150}=22.79$, $P<.001$) and nightmares per week ($F_{2,150}=23.31$, $P<.001$). For the 73 women who completed both PSQI follow-ups ($F_{2,142}=3.35$, $P<.04$) and the 66 women who completed both PSS follow-ups ($F_{2,128}=7.04$, $P<.001$), mean differences were statistically significant (FIGURE 2). These treatment group improvements occurred during the first 3 months (treatment vs control group $d=1.15$ vs 0.07 for nights per week, 0.95 vs −0.06 for nightmares per week, 0.77 vs 0.31 for PSQI, and 1.06 vs 0.31 for PSS) and were sustained from 3 to 6 months (with no patient contact during this interval).

The conservative intent-to-treat analysis confirmed significant differences between treatment and control groups on all 5 main outcome measures for nightmares, sleep, and PTSD (all $P\leq.02$), but effect sizes were smaller (mean treatment $d=0.60$ vs mean control $d=0.14$) compared with end-point and 3-point analyses.

Moderator Variable Effects

At follow-up, there were no significant differences for concurrent use of psychotherapy or use of anxiolytics/hypnotics or antidepressants between control and treatment completer groups (Table 3). However, to test for moderator effects on treatment, 3-factor treatment × time × moderator variable end-point analyses were conducted on each main outcome measure. Notwithstanding low power for these analyses, no reliable main or interaction effects were found on outcomes (nights per week, nightmares per week, PSQI, PSS, and CAPS) for concurrent psychotherapy, antidepressant use, anxiolytic/hypnotic use, or degree of high-magnitude sexual assaults, or repeated exposure to sexual abuse

Table 1. Baseline Characteristics of Control and Treatment Groups by Completer vs Noncompleter Status*

Variables	No. of Subjects	Control Group		Treatment Group		*P* Value
		Completer† (n = 60)	Noncompleter (n = 20)	Completer† (n = 54)	Noncompleter (n = 34)	
Mean (SD) age, y (range, 18-74 y)	168	36 (9.3)	31 (10.5)	40 (11.2)	37 (12.7)	.01
Education						
College degree	64	25 (42)	6 (30)	26 (48)	7 (21)	.06
No college degree	104	35 (58)	14 (70)	28 (52)	27 (79)	
Marital status						
Married/lives with partner	67	26 (43)	8 (40)	25 (46)	8 (24)	.17
Not with partner	101	34 (57)	12 (60)	29 (54)	26 (76)	
Ethnicity						
Non-Hispanic white	105	35 (58)	9 (45)	38 (70)	23 (68)	.18
Other (mostly Hispanic)	63	25 (42)	11 (55)	16 (30)	11 (32)	
Annual income, $						
≤10 000	75	21 (35)	11 (55)	24 (44)	19 (56)	.18
>10 000	93	39 (65)	9 (45)	30 (56)	15 (44)	

*Data are expressed as number (percentage) unless otherwise indicated.
†Completed 3- and/or 6-month follow-up.

Table 2. End-Point Analysis of Main Outcome Measures for Control vs Treatment Groups by Completer vs Noncompleter Status

Variables*	No. of Subjects	Control Group, Mean (SD)		Treatment Group, Mean (SD)		F Statistic	*P* Value
		Completer (n = 60)	Noncompleter (n = 20)	Completer (n = 54)	Noncompleter (n = 34)		
Nightmares, No.							
Nights per week	167	3.68 (2.05)	4.05 (2.17)	3.88 (2.06)	4.29 (2.10)	$0.67_{3,163}$	.57
Nightmares per week	167	5.41 (4.31)	6.37 (5.61)	6.37 (4.96)	6.79 (5.38)	$0.69_{3,163}$	.56
Sleep							
PSQI global score	166	13.34 (4.13)	13.32 (3.59)	10.85 (3.69)	12.94 (4.64)	$1.80_{3,161}$	.15
Posttraumatic stress disorder (PTSD)							
CAPS score	167	79.22 (27.74)	84.75 (20.34)	80.37 (18.31)	88.88 (21.10)	$1.66_{3,163}$	.18
PSS total score	167	28.85 (11.83)	31.35 (11.01)	28.30 (10.37)	31.21 (12.38)	$0.69_{3,163}$	.56

*PSQI indicates Pittsburgh Sleep Quality Index; CAPS, Clinician-Administered PTSD Scale; and PSS, PTSD Symptom Scale.

prior to the study. These moderators did not reduce the magnitude of the treatment × time effects. Because age was significantly different at baseline between groups, it was entered as a covariate into each end-point analysis for the main outcome variables and was not statistically significant (all $P>.40$).

Secondary Measures

Large improvements for NES ($F_{1,110}=19.85$, $P<.001$, $d=1.07$), NDQ ($F_{1,92}=18.33$, $P<.001$, $d=1.31$), and PSQI-A ($F_{1,109}=23.75$, $P<.001$, $d=1.15$) were found for the treatment group, whereas small effects were found for the control group (NES, $d=0.14$; NDQ, $d=0.27$; PSQI-A, $d=0.21$). Moderate improvements were found for depression in both treatment ($d=0.57$) and control ($d=0.33$) groups without statistical differences. Anxiety symptoms improved slightly in the treatment group ($d=0.39$) and worsened in the control group ($d=-0.16$) ($F_{1,80}=183.84$, $P=.04$). Moderate improvements in the treatment group compared with controls were observed on SDI for social life/leisure activities ($F_{1,93}=4.15$, $P=.04$, $d=0.54$ vs $d=0.14$) and in interviewer-rated global disability ($F_{1,93}=6.45$, $P=.01$, $d=0.48$ vs $d=-0.11$). Quality of life (SF-36) showed no significant changes for either treatment or control groups.

COMMENT

Imagery rehearsal therapy significantly improved disturbing dreams, sleep quality, and posttraumatic stress symptoms in sexual assault survivors presenting with nightmares, insomnia, and posttraumatic stress. Therapeutic effects occurred at 3 months follow-up and were maintained at 6 months in comparison with a control group, which showed on average small or no improvement at either follow-up. End-point and 3-point analyses yielded significant results with large effect sizes, and intent-to-treat analysis showed moderate effect sizes. Regardless of participants' concurrent use of medication or psychotherapy, IRT—a dream- and sleep-oriented treatment—substantially improved not only nightmares and sleep, but also decreased mean PTSD symptom severity from moderately severe to moderate levels. All symptom subscales for PTSD intrusion, avoidance, and arousal decreased as well. To our knowledge, this is the first randomized controlled study demonstrating that improvement in PTSD symptoms with a nightmare-focused intervention is both substantial and sustained at 6 months follow-up; these changes in posttraumatic stress were comparable to a recent PTSD treatment study using sertraline.[41]

Mechanisms for these treatment effects may be understood through several perspectives. In a sleep model, nightmares, which may be a natural response to trauma, nonetheless function like insomnia by triggering difficulties in falling or staying asleep; nightmare sufferers carry an added burden of "fear of sleep."[16] Thus, nightmares and insomnia are inextricably linked in many PTSD patients, and successful treatment of nightmares ought to improve sleep and sleep-related effects on distress. Perhaps by decreasing bad dreams and improving sleep quality, PTSD patients improve daytime energy, which facilitates coping with other distress symptoms. In this model, sleep problems in PTSD are not merely a secondary manifestation. Instead, sleep functions as a vulnerable psychophysiological system that suffers primary damage through traumatic exposure. Subsequently, if the sleep system were repaired through whatever means, it might facilitate, enhance, or maximize therapeutic outcomes. Further evidence of sleep problems in PTSD is emerging; high rates of medical sleep disorders, such as sleep-disordered

Table 3. Differences in the Distribution of Potential Treatment Moderators by Study Group by Completion Status*

Variables	Control Group		Treatment Group		*P* Value†
	Completer	Noncompleter	Completer	Noncompleter	
Concurrent psychotherapy					
Baseline					
Yes (n = 111)	34 (65)	17 (63)	32 (73)	28 (67)	.82
No (n = 54)	18 (35)	10 (37)	12 (27)	14 (33)	
Follow-up					
Yes (n = 44)	9 (19)	. . .	10 (23)	. . .	.64
No (n = 48)	39 (81)	. . .	34 (77)	. . .	
Antidepressant use					
Baseline					
Yes (n = 79)	23 (44)	7 (26)	27 (61)	22 (52)	.03
No (n = 86)	29 (56)	20 (74)	17 (39)	20 (48)	
Follow-up					
Yes (n = 44)	16 (33)	. . .	18 (41)	. . .	.52
No (n = 48)	32 (67)	. . .	26 (59)	. . .	
Anxiolytic/hypnotic use					
Baseline					
Yes (n = 47)	16 (31)	8 (30)	13 (30)	10 (24)	.89
No (n = 118)	36 (69)	19 (70)	31 (70)	32 (76)	
Follow-up					
Yes (n = 44)	9 (19)	. . .	5 (11)	. . .	.32
No (n = 48)	39 (81)	. . .	39 (89)	. . .	
High-magnitude sexual assault‡					
Yes (n = 132)	45 (75)	15 (75)	43 (81)	29 (85)	.63
No (n = 35)	15 (25)	5 (25)	10 (19)	5 (15)	
Repeated exposure to sexual abuse‡					
Yes (n = 97)	36 (60)	14 (70)	28 (53)	19 (56)	.58
No (n = 70)	24 (40)	6 (30)	25 (47)	15 (44)	

*Data are expressed as number (percentage). Ellipses indicate no follow-up data are available for control and treatment noncompleters.
†*P* reflects the test of the difference in proportions by study group by completion status for each potential moderator at baseline and at follow-up.
‡Baseline data only.

breathing, have recently been described in PTSD samples,[42-45] and treatment of sleep-disordered breathing with continuous positive airway pressure breathing masks in a small number of PTSD patients has been associated with decreased nightmares, insomnia, and posttraumatic stress symptoms.[46,47]

In a cognitive-behavioral model, nightmares are noxious conditioned stimuli triggering a conditioned response, ie, waking up from the bad dream to avoid unpleasant emotions. Arousal from the dream reinforces the belief that the only way to diminish the stimuli is to not sleep. The schema of an unsafe sleep environment develops and is maintained by the view that nightmares are a fixed and somehow necessary reminder of traumatic experiences, thus arousal remains essential to protecting oneself in the bedroom. Imagery rehearsal therapy is a reciprocal inhibitor to the original nightmare, providing a cognitive shift that empirically refutes the alleged "purpose" of the nightmare.

In a mastery model—another variation of cognitive-behavioral therapy—IRT impresses on patients that they can control their nightmares. In fact, many reported that altering nightmares gave them a sense of control that carried over to wake time activities. Almost 50% of treatment completers reported using imagery for other problems beyond nightmares. One participant used IRT to give

Table 4. Mean of Baseline, End Point (3- or 6-Month Follow-up), and Change Scores for Nightmares, Sleep, and Posttraumatic Stress Disorder (PTSD)

Variables/Groups	No. of Subjects	Mean (SD)			Cohen *d**	F Statistic†	*P* Value
		Baseline	End Point	Change			
Nightmares, No.							
Nights per week							
Control	60	3.68 (2.05)	3.28 (2.31)	0.40 (1.63)	0.20	$32.31_{1,112}$	.001
Treated	54	3.88 (2.06)	1.33 (1.67)	2.55 (2.37)	1.24		
Nightmares per week							
Control	60	5.41 (4.31)	5.97 (6.10)	−0.56 (4.72)	−0.12	$16.82_{1,112}$	.001
Treated	54	6.37 (4.96)	2.43 (5.21)	3.94 (6.88)	0.85		
Sleep							
PSQI global score‡							
Control	58	13.31 (4.16)	12.76 (4.63)	0.55 (4.23)	0.13	$8.10_{1,109}$	.001
Treated	53	10.94 (3.66)	8.21 (3.99)	2.74 (3.82)	0.67		
PTSD							
CAPS score§							
Control	52	79.62 (24.37)	68.37 (27.26)	11.25 (21.65)	0.53	$23.07_{1,95}$	.001
Treated	45	81.88 (16.96)	49.58 (23.96)	32.31 (21.40)	1.53		
PSS total score‖							
Control	58	28.48 (11.73)	25.26 (11.78)	3.22 (9.02)	0.29	$17.21_{1,110}$	.001
Treated	54	28.29 (10.37)	17.19 (10.39)	11.11 (11.06)	1.00		

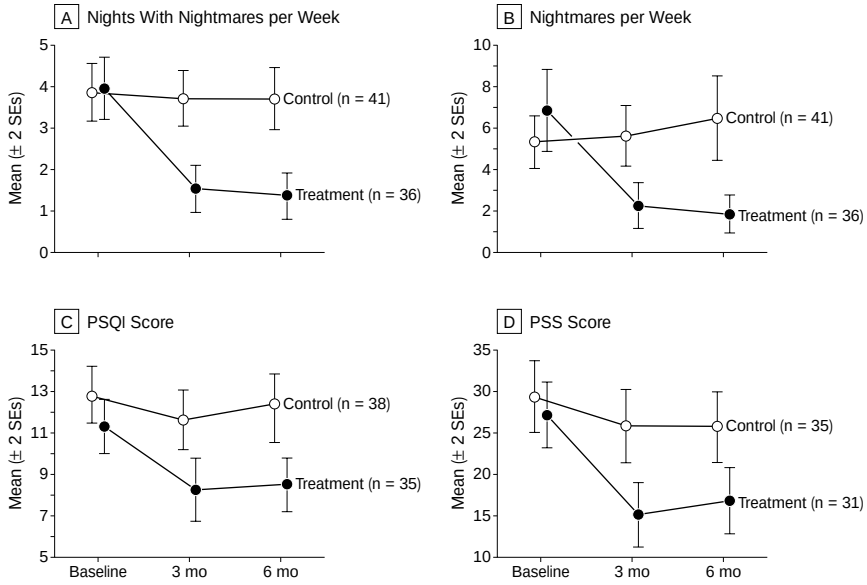
*Cohen *d* is the standardized mean difference.
†Treatment × time interaction effect.
‡Missing variable(s) from baseline for 1 participant and end point for 3 participants. PSQI indicates Pittsburgh Sleep Quality Index.
§Missing variable(s) from baseline for 1 participant and end point (Clinician-Administered PTSD Scale [CAPS] not administered at 3 months) for 17 participants.
‖Missing variable(s) from baseline for 1 participant and end point for 2 participants. PSS indicates PTSD Symptom Scale.

Table 5. Clinical Severity Changes for Nightmares and Posttraumatic Stress Disorder (PTSD) in Treatment and Control Groups at Baseline and End-Point Follow-up*

	Treatment Group (n = 54)				Control Group (n = 60)			
	Mild	Moderate	Moderate to Severe	Severe	Mild	Moderate	Moderate to Severe	Severe
PSS score								
Baseline	2 (3.7)	11 (20.4)	28 (51.9)	13 (24.1)	4 (6.7)	11 (18.3)	27 (45.0)	18 (30.0)
Follow-up	18 (33.3)	14 (25.9)	19 (35.3)	3 (5.6)	6 (10.0)	17 (28.3)	19 (31.7)	18 (30.0)
	None	Low	Moderate	High	None	Low	Moderate	High
Nights with nightmares								
Baseline	0 (0.0)	8 (14.8)	28 (51.9)	18 (33.3)	0 (0.0)	9 (15.0)	30 (50.0)	21 (35.0)
Follow-up	6 (11.1)	32 (59.3)	13 (24.1)	3 (5.6)	1 (1.7)	15 (25.0)	26 (43.3)	18 (30.0)
No. of nightmares								
Baseline	0 (0.0)	5 (9.3)	18 (33.3)	31 (54.4)	0 (0.0)	7 (11.7)	22 (36.7)	31 (51.7)
Follow-up	6 (11.1)	30 (55.6)	10 (18.5)	8 (14.8)	1 (1.7)	12 (20.0)	18 (30.0)	29 (48.3)

*Data are expressed as number (percentage) within each group. PTSD scores are based on Foa[40] scoring system for the newer Posttraumatic Stress Diagnostic Scale, which yields the same total range of 0 to 51 as the PTSD Symptom Scale (PSS) (mild = 1-10, moderate = 11-20, moderate to severe = 21-35, severe = 36-51). Nightmare indexes are based on clinical and research experience: low, ≤1 night or nightmare per week; moderate, 2 to 4 nights or nightmares per week; high, ≥5 nights or nightmares per week. To accommodate the categorical repeated measure, changes in category between baseline and follow-up were calculated for treated and control subjects. Analysis was conducted using the exact Wilcoxon-Mann-Whitney test, and for all 3 variables, $P<.001$. Almost all control subjects remained in the same or within 1 category between baseline and follow-up, whereas PTSD and nightmares in treated subjects mostly decreased in severity.

Figure 2. Main Outcome Variables at Baseline, 3-Month, and 6-Month Follow-up



Data are shown for nights with nightmares and number of nightmares per week (n=77), Pittsburgh Sleep Quality Index (PSQI) (n=73), and the PTSD Symptom Scale (PSS) (n=66).

herself "more positive images, because [she has] a tendency to think negatively," and another wrote she gained a "feeling of control over [daytime] moods" and uses IRT to "correct negative or obsessive thoughts." A mastery framework is also offered at one point in the first treatment session to help patients distinguish between "suffering from nightmares" and "being a nightmare sufferer." This distinction has proven important because most individuals whom we treated reported the duration of their problem for more than a decade; unsuccessfully attempted various therapies, at least indirectly, to ameliorate their bad dreams; and had acquired a belief that nightmares were a fixed, deeply rooted problem that could not be remedied. In short, a "nightmare sufferer identity" seems to have developed in these women, such that on entry into the program, it was almost unimaginable that nightmares could be alleviated within a few months' time. In our view, the mastery aspects of IRT are at the heart of the patient's ability to shed the "nightmare sufferer identity" because, clinically, success appeared to evolve among those who adopted 3 key elements of the protocol: nightmares are not inextricably linked to past trauma; nightmares can be treated as if they were a learned behavior; and nightmares can be controlled by working on them while awake. For some patients, it was the rapid resolution of nightmares that prompted acceptance of these elements, which further enhanced their mastery of the nightmare disorder.

A recent consensus statement concluded that selective serotonin reuptake inhibitors and exposure therapy are first-line therapies for PTSD.[48] Exposure therapy, however, intimidates some patients.[49] Anecdotally, when patients start exposure treatment with desensitization procedures but do not finish, they may worsen their PTSD by reinforcing avoidance behavior. Psychotropic medications may also produce adverse effects in PTSD patients who then discontinue therapy.[41] Imagery rehearsal therapy produces imagery adverse effects; 4 patients reported increased negative imagery and eventually withdrew, and 12 of 66 who completed treatment did not complete follow-up for unknown reasons. Notwithstanding, this cognitive-imagery approach deemphasizes exposure and discourages discussion of trauma-related experiences. Its primary focus is to help people sleep better by teaching them how to eliminate disturbing dreams. Given the large treatment outcomes, apparent minimal adverse effects, and brevity, physicians and therapists might choose IRT as a first-line treatment regimen for PTSD patients who are distressed by their nightmares. This treatment approach also may be suitable for PTSD cases that are resistant, refractory, or otherwise averse to exposure or medication. Posttraumatic stress disorder treatment studies comparing IRT, exposure therapy, and psychotropic medications are needed to examine differences between these regimens as well as their potential therapeutic synergy.

Two important limitations in this study were (1) the lack of a placebo control, which may have led to spuriously high effect sizes due to nonspecific therapist effects[50]; and (2) relatively large dropout rates for 3- and/or 6-month follow-ups. Neither of these limiting aspects of design and follow-up can be overcome, but it can be mentioned that these noncompletion rates were not dissimilar to other research protocols for sexual assault survivors,[29] as well as other traumatized populations,[41] and the intent-to-treat analysis confirmed the reliability of the results albeit with moderate rather than large effect sizes. Last, treatment group noncompleters appeared to have slightly worse nightmares, sleep disturbance, and PTSD at baseline; therefore, individuals with worse distress may have greater aversion to this therapy.

Among current health care options, persons with chronic nightmares and PTSD who are seeking treatment for posttraumatic stress symptoms might be offered singly or in combination 1 of 3 reasonably effective therapeutic approaches: (1) abreaction-catharsis through psychodynamic psychotherapy[51]; (2) exposure therapy[48,49]; or (3) psychotropic medication.[41,48,49] In addition, IRT directly targeting disturbing dreams appears to be another useful therapeutic option for sexual assault survivors with chronic nightmares and PTSD.

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