

Word count (including everything): 5071

Abstract: 154 words

Dissociative symptoms and sleep parameters - An all-night polysomnography study in patients with insomnia

Dalena Van Der Kloet¹, Harald Merckelbach¹, Timo Giesbrecht¹

¹ Faculty of Psychology and Neuroscience, Maastricht University, The Netherlands

Erik Franck², Ann Van Gastel²³, Ilse De Volder²³, Filip Van Den Eede²³

² Faculty of Medicine and Health Sciences, University of Antwerp, Belgium

³Antwerp University Hospital, Belgium

Bruno Verschuere¹⁴⁵

⁴Department of Clinical Psychology, University of Amsterdam, The Netherlands

⁵Department of Psychology, Ghent University, Belgium

Abstract:

Dissociative disorders encompass a range of symptoms varying from severe absent-mindedness and memory problems to confusion about one's own identity. Recent studies suggest that these symptoms may be the by-products of a labile sleep-wake cycle.

In the current study, we explored this issue in patients suffering from insomnia ($N = 46$). Patients stayed for at least one night in a specialized sleep clinic, where a range of sleep EEG parameters were obtained. In addition, they completed self-report measures of dissociation, unusual sleep experiences, sleep quality, and trauma history.

We found that dissociative symptom levels were elevated in patients suffering from insomnia. Dissociative symptoms were correlated with unusual sleep experiences and poor sleep quality. Longer REM sleep periods and less time spent awake during the night was predictive of dissociation. Finally, dissociation was not related to traumatic experiences.

Our results hold promise for a better understanding of the etiology of dissociative symptoms and their treatment.

Key words: dissociation, insomnia, polysomnography study, unusual sleep experiences

Introduction

Dissociative symptoms form a heterogeneous class of experiences varying from absent-mindedness, excessive daydreaming, and memory problems to confusion about one's own identity. In their most radical version, such symptoms define conditions like dissociative amnesia and depersonalization disorder. Given their stark heterogeneity, it is not surprising that dissociative disorders are among the most controversial nosological categories listed in the *Diagnostic and Statistic Manual of Mental Disorders* (DSM-IV-TR)¹. To date, there is no agreed-upon conceptualization of the taxonomy and aetiology of dissociative symptoms².

Epidemiological studies among psychiatric inpatients and outpatients have yielded prevalence estimates of severe dissociative symptoms, with rates usually exceeding 10%³, while a recent epidemiological study in the general population from the UK found a prevalence rate of 0.95%⁴. Such symptoms are not restricted to the dissociative disorders. Certain diagnostic groups, notably patients with borderline personality disorder, post traumatic stress disorder (PTSD), obsessive compulsive disorder, and schizophrenia also display heightened levels of dissociative symptoms⁵⁻⁷. Prevalence rates of dissociative symptoms may also be raised in certain populations like, for example, homeless and runaway youths⁸.

A recurrent theme in the clinical literature on dissociative symptoms is that they are caused by aversive experiences. More specifically, the idea is that dissociative symptoms like amnesia and derealisation help individuals to detach themselves from aversive life experiences⁹. Although there is correlational evidence to back up the link between dissociative symptoms and aversive life experiences¹⁰, the question remains how such experiences might set into motion dissociative symptomatology.

An older idea that recently gained momentum focuses on sleep disturbances and how they might contribute to dissociative symptomatology. Thus, Levitan¹¹ hypothesized that “depersonalization is a compromise state between dreaming and waking” (p. 157). Recent studies have found a robust link between dissociation and sleep aberrations¹²⁻¹⁴. This finding has inspired some authors to speculate that a labile sleep-wake cycle may undermine cognitive efficiency and cause dreamlike mentation to emerge during waking consciousness, thereby fuelling dissociative symptoms¹⁵. There is some indirect evidence to support this hypothesis. For example, McNally and Clancy¹⁶ relied on a sample of individuals who reported a history of child sexual

abuse. In their sample, dissociative symptoms were more common in participants who had experienced sleep paralysis compared to those without such sleep experiences. Dissociative symptoms also go along with increased frequencies of nightmare reports¹⁷ and PTSD patients not only have raised levels of dissociative symptoms, but they also exhibit heightened nightmare frequency and REM sleep density, and often suffer from insomnia¹⁸.

If sleep disturbances are a critical factor in the development of dissociative psychopathology, one might expect that patients with insomnia have heightened levels of dissociative symptoms. After all, the majority of patients who suffer from (primary) insomnia have a disturbed sleep-wake cycle¹⁹. In this study, we examined whether patients with insomnia have, indeed, raised scores on a validated questionnaire measuring dissociative symptomatology. Additionally, and more exploratory, we investigated to what extent these symptoms are related to unusual sleep experiences, sleep quality, and EEG parameters. We expected dissociation to be related to worse sleep quality and increased unusual sleep experiences.

Method

Patients

The sample consisted of 45 consecutive inpatients (18 men, 28 women) who had been referred to Antwerp University Hospital, Belgium in the period between January 2010 and April 2010. Inclusion criterium entailed the diagnosis with primary insomnia (i.e., suffering from a variety of sleep complaints, such as having trouble with falling asleep, night-time awakenings, waking up early, and/or non refreshing sleep. Mean age of the patients was 41.5 years (range: 17 to 78 years). The majority of them were married or lived together with their partner (71.2%). A small portion was either divorced (6.5%) or single (19.6%). Educational background (i.e., years of education) ranged from limited (10.8%) to extended (39.1%). Thirty-four patients (73.9%) were using different psychopharmaca during the study. Medication included benzodiazepine agonists (21.7%), melatonin (2.2%), antidepressants (32.6%), pain medication (13%), and neuroleptics (4.3%). Twenty-eight percent of the patients suffered from a (self-reported) psychiatric disorder (e.g., mood-, or anxiety disorder) at the time of the study, and were unable to work due to their complaints for a mean of 22 days ($SD = 35.9$) over the last three months. The group of participants ($N = 45$) had not been able to execute their normal activities for a mean of 18.5 days ($SD =$

34.0) during the last three months. Eight patients (17.4%) were hospitalized in the last three months (mean duration: 1.98 days ($SD = 9.01$)).

All patients had been referred for assessment of their persisting insomnia complaints. As part of the routine procedure, participants completed a number of self-report questionnaires (see Measures) during their stay of one or two nights in the specialized sleep clinic of Antwerp University Hospital. During their stay, data on sleep parameters were collected. For participants where data for two nights were available ($N = 13$, 28%), the second night was used in analyses.

Patients provided written informed consent for the use of their data for the purpose of the present study. The study was approved by the standing ethical committee of the Antwerp University Hospital (B30020107809).

Measures

Dissociative Experiences Scale (DES; Cronbach's $\alpha = 0.94$)²⁰. The DES is a self-report scale that requires participants to indicate on 100 mm visual analogue scales (anchors: 0 = never; 100 = always) to what extent they experience 28 dissociative experiences in daily life. Examples of such experiences include feelings of depersonalization, derealization, and psychogenic amnesia. Van IJzendoorn and Schuengel²¹ provide meta-analytic evidence for the sound psychometric properties of the DES. In the current study, we calculated a mean total score of the 28 DES items.

Symptom Check List –90 – Revised (SCL-90-R; Cronbach's $\alpha = 0.98$)²². The SCL-90-R is a widely used self-report inventory measuring a broad range of psychopathological symptoms (e.g., depression, anxiety, somatic symptoms) in clinical as well as general population samples. In the current study, we used the validated Dutch version of the SCL-90-R²³ and calculated the Global Severity Index (GSI), which is the mean total score of the 90 SCL-90-R items.

Iowa Sleep Experiences Scale (ISES; Cronbach's $\alpha = .90$)¹². The ISES consists of 18 items asking the respondent to rate the frequency of various sleep-related and dream-related experiences on a 7-point Likert scale (anchors: 1 = never; 7 = several times a week). The ISES consists of two separate subscales: general sleep experiences (Cronbach's $\alpha = .90$, e.g., "I have recurring dreams") and lucid dreaming (Cronbach's $\alpha = .83$, e.g., "I am aware that I am dreaming, even as I dream"). The general sleep experiences subscale taps symptoms of narcolepsy, vivid and unusual dreams, and

other distinct sleep experiences. The lucid dream subscale consists of several items that refer to the experience that one is aware of dreaming while still being asleep. Previous research by Watson¹² shows that these two subscales measure distinct constructs. Watson^{12,24} obtained evidence for the convergent validity and internal consistency of the ISES.

*Pittsburgh Sleep Quality Index (PSQI; Cronbach's $\alpha = 0.63$)*²⁵. The PSQI is a self-report instrument measuring sleep quality and sleep aberrations during the last month. Consisting of 19 items, it measures seven aspects: subjective sleep quality, sleep latency, sleep efficiency, sleep time, sleep aberrations (e.g., nightmares, snoring, leg movements), medication use, and daytime aberrations (e.g., problems with staying awake during driving, eating, or social situations). The sum score of the 7 components forms a total score. Buysse and colleagues²⁵ examined the psychometric properties of the PSQI using a 18 months longitudinal design to monitor “good” and “bad” sleepers. They found an acceptable test-retest reliability and validity. The PSQI has reasonable sensitivity (89%) and specificity (85.5%) in differentiating between good and bad sleepers, making it a useful tool for clinical use as well as research²⁵.

*Brussels Indices of Sleep Quality (BISQ)*²⁶. The BISQ is a 29 items self-report instrument, developed by the Free University of Brussels, to measure subjective feelings of sleep quality, and sleep parameters such as sleep efficiency, night-time awakenings, and sleepiness during the day. Sum scores of the items lead to three scales measuring; 1) subjective sleep quality, 2) whether sleep quality is better or worse than usual, and 3) the acceptability of sleep quality. It has not been validated yet.

*Traumatic Experiences Checklist (TEC; Cronbach's $\alpha = 0.82$)*²⁷. The TEC is a reliable and valid self-report instrument to measure physical abuse, emotional abuse and neglect, sexual harassment, and sexual abuse, as well as other traumatic experiences. The TEC has especially been employed with psychiatric outpatients²⁷, but has also been administered to nonclinical samples where it is suitable to capture low scores²⁸. The correlation between the TEC and the Stressful Life Events Screening Questionnaire (SLESQ)²⁹ is relatively high, $r = 0.77$, $p < 0.01$. In this study, we used the 26-items version of the TEC, which yields a total score between 0 and 26, with higher scores indicating higher levels of self-reported trauma.

Polysomnographic measures

Polysomnography during the night was performed, using EEG, EOG and EMG measurements (BrainRT, OSG, Rumst, Belgium). Electrodes for EEG registration were applied according to standard criteria of the American Academy of Sleep Medicine (AASM)³⁰, using frontal, central and occipital head electrodes with reference electrodes at the mastoids. Central EEG (C4-A1; C3-A2), frontal EEG (C4-F4) and occipital EEG (A1-O2) recordings were obtained. EOG electrodes were placed at the outer canthi of the orbits and EMG was measured at the chin.

Sleep stages were scored according to the rules of the AASM³⁰. This allowed determination of total sleep time (TST) defined as the total sleep period minus periods awake during this period, sleep efficiency index (SEI) defined as the ratio of TST/Time in Bed, sleep latency (SL) and relative duration of sleep stages all expressed as percentage of Sleep Period Time (SPT; time from sleep onset to last epoch of sleep). ECG was measured during the whole time in bed period. For the purpose of the current study, we focus on % sleep efficiency, sleep latency, % WASO (wake after sleep onset), % REM SPT, % S1 SPT, and ECG.

Statistical procedure

Statistical analyses were performed using SPSS 18.0 software. Cronbach's α values were used to estimate internal consistency of the DES, SCL-90, ISES, PSQI, BISQ, and TEC. Pearson product-moment correlations were used to examine the relation between the questionnaires and sleep parameters.

Results

Table 1 shows mean scores of all self-report measures as well as Pearson product-moment correlations between the measures.

Mean scores on DES did not significantly differ from those obtained in a sample of 386 Dutch outpatients suffering from a variety of psychopathology ($t = 0.96, p = 0.34$)³¹. Mean scores on DES were significantly greater compared to mean DES scores in an American/Canadian normal adult sample ($N = 415; t = 4.13, p < 0.001$)³². Four out of 46 participants (8.7%) displayed dissociation levels exceeding the clinical cut-off score for dissociative disorders (i.e., DES scores > 30)³³. This is in accordance with our hypothesis.

Participants rated the quality of their sleep (BISQ) with a number between 1 (very poor) and 10 (excellent). Their mean rating was 5.2 ($SD: 1.82$). Finally, they

were asked to indicate on a 5-point Likert scale (range: 0 = 'not at all sleepy', to 4 = 'very sleepy') how sleepy they felt upon awakening. 61 % of the patients scored '2' or more, indicating that they felt 'rather sleepy' to 'very sleepy'. A majority (73%) of the patients said that their sleep complaints were unacceptable to bear. Sleepiness upon awakening was significantly correlated with DES scores, $r = 0.45$, $p < 0.01$.

Significant correlations were found between self-reported dissociative symptoms (DES) and the GSI of the SCL-90, on the one hand, and the two sleep measures (ISES; PSQI), on the other hand, indicating that heightened dissociative levels and general psychopathology were related to worse sleep quality and unusual sleep experiences. Self-reported traumatic experiences (TEC) were not related to dissociation (DES), but were significantly related to GSI, unusual sleep experiences (ISES), and sleep quality (PSQI), suggesting that patients with a history of traumatic experiences showed elevated general psychopathology and unusual sleep experiences, as well as poorer sleep quality.

Polysomnographic measures showed that patients had a mean sleep onset of 42 minutes ($SD = 38$; *range*: 10 – 210). Mean sleep onset latency was 23 minutes ($SD = 21$; *range*: 4.2 – 112.3), and mean number of minutes awake after sleep onset was 48 minutes ($SD = 37$; *range* = 1 – 164). Their subjective estimate of the hours spent asleep was 5.2 hours ($SD = 1.9$ hours; *range*: 2 – 10 hours).

The BISQ correlated with several objective sleep parameters indicating that patients' subjective experience of sleep quality was in line with such objective measures as sleep efficiency, total sleep time, and time spent awake, in REM, and in S1²⁶.

Table 2 displays the Pearson product-moment correlations between self-report measures and objective sleep parameters obtained during polysomnographic recordings. As expected (see the second hypothesis in the introduction section), the DES correlated positively with the percentage of sleep period time spent in REM sleep. We conducted an independent samples t-test to compare the percentage of REM sleep in participants using medication, and participants not using medication, as antidepressants may influence REM sleep. Less time spent in REM sleep was not related to the use of medication ($t = -1.07$, $p = 0.29$). Also, the DES correlated negatively with time spent awake during sleep period time. Both ISES and PSQI correlated significantly and positively with mean ECG rate. Finally, ISES correlated positively with total REM time in minutes.

Discussion

This study is – to the best of our knowledge – the first study to examine dissociative symptoms in patients with insomnia. Our findings can be catalogued as follows.

First, we replicated research showing a solid link between sleep experiences and dissociative symptoms^{12,34-36}, and – to the best of our knowledge – showed for the first time an elevation of dissociative symptoms in a group of insomnia patients.

Second, dissociative symptoms did not correlate with self-reports of traumatic experiences, but trauma was positively related to the two sleep measures (ISES and PSQI). This is in line with the idea that sleep disturbances rather than traumatic experiences per se may be the stage setter for dissociative symptoms. Because our study was cross-sectional in nature, it does not allow for strong causal conclusions. Nevertheless, one possibility is that aversive childhood traumatic experiences, but not only traumatic experiences for that matter, might lead to sleep disturbances, which in turn might serve as a more proximal antecedent of dissociative symptoms. This line of reasoning might reconcile seemingly conflicting theories about the origins of dissociative symptoms^{9,2,37}.

Third, dissociative symptoms were related to elevated periods of sleep time spent in REM sleep, and to more sleepiness at awakening. This is reminiscent of recent literature about REM sleep. For example, Levin and Nielsen³⁸ emphasized the concept of “cross-state continuity,” which assumes that “...some structures and processes implicated in nightmare production are also engaged during the expression of pathological signs and symptoms during the waking state” (p. 483). Thus, an influx of dreamlike mentation during the day may fuel dissociative symptoms. A related view is the notion of transliminality³⁹, which assumes that there exist robust individual differences in the extent to which mentation may cross thresholds into and out of consciousness. Using a self-report scale that intends to measure this trait – the Revised Transliminality Scale (RTS) – Soffer-Dudek and Shahar⁴⁰ showed in a longitudinal study that people who score high on transliminality (i.e., who are attuned to their inner fantasy life) subsequently report more unusual sleep experiences than those who score low on this trait.

There is also consensus that REM sleep is important for emotional memory formation⁴¹. For instance, Crick and Mitchison⁴² proposed that during REM sleep, a

process they dubbed ‘reverse learning’ functions to weaken certain traces in memory in order to improve memory by “...separating distinct memories from each other which nevertheless have something in common, so that the system is less confused”. In sum, “we dream to reduce fantasy” (p.150). This proposal might explain why people who report sleep disturbances often score high on dissociation and fantasy proneness³⁵. Our finding that dissociative symptoms are related to more intense REM periods might reflect more cognitive effort to cope with irrelevant and noisy memory traces, especially when the memory is emotional in nature⁴¹. That this issue is of more than academic interest is demonstrated by case vignettes of patients with narcolepsy who misinterpret their dreamlike hallucinatory experiences as real events and sincerely believe that they have been the victim of sexual assault or another offence⁴³.

Fourth, dissociation was related to less time spent awake during the night. This does not concur with our previous study that found dissociative symptoms in a healthy sample to be related to more fragmented sleep¹³. We have no ready explanation for these conflicting findings but they might be explained by the different samples (patients with insomnia versus healthy individuals), the different methods for measuring fragmented sleep in the two studies, and the different context (psychological laboratory versus sleep laboratory). Also, it is well known among clinicians that patients suffering from psychophysiological insomnia tend to sleep better during recordings in the hospital, than they sleep at home.

Finally, a higher heart rate during the night correlated with higher scores on both sleep measures (ISES, PSQI), which is to be expected because it seems likely that patients with more sleep aberrations also exhibit more elevated heart rate during the night. In general, then, it appears that dissociative symptoms are more related to the cognitive aspects of sleep (i.e., REM sleep), while self-reported sleep disturbances are primarily related to the arousal aspects of sleep.

Some limitations of this study merit attention. The small sample size, the cross-sectional design, the use of medication, and the absence of a control group restrict the interpretation and generalization of the results. However, the current sample consisted of a unique group of insomnia patients and the correlates of dissociation that we found in this group are important because they might inform further theorizing about the etiology of dissociative symptoms.

In conclusion, our finding that dissociation levels are elevated in patients suffering from insomnia compared to a normal adult sample, and are related to

various sleep parameters suggests several avenues for future research. Research that addresses the sleep-dissociation link in clinical samples is urgently needed, because most previous studies have relied on undergraduate student samples. Future studies might elucidate the type of sleep architecture that is most reliably associated with different dissociative disorders in a longitudinal design, and then establish remediation programs, including medication regimens, to address underlying sleep deficits and irregularities. This would be an entirely novel and exciting lead.

References

- ¹ American Psychiatric Association. Diagnostic and statistical manual of mental disorders. Washington, DC, 2000.
- ² Giesbrecht T, Lynn SJ, Lilienfeld SO, Merckelbach H. (2008). Cognitive processes in dissociation: An analysis of core theoretical assumptions. *Psychological Bulletin* 2008;134:617-47.
- ³ Foote B, Smolin Y, Kaplan M, Legatt ME, Lipschitz D. Prevalence of dissociative disorders in psychiatric outpatients. *American Journal of Psychiatry* 2006;163:623-29.
- ⁴ Lee WE, Kwok CHT, Hunter ECM, Richards M, David AS. Prevalence and childhood antecedents of Depersonalization Syndrome in a UK Birth Cohort. *Social Psychiatry and Psychiatric Epidemiology*. In Press;DOI: 10.1007/s00127-010-0327-7
- ⁵ Rufer M, Fricke S, Held D, Cremer J, Hand I. Dissociation and symptom dimensions of obsessive-compulsive disorder – A replication study. *European Archives of Psychiatry and Clinical Neuroscience* 2006;256:146-50.
- ⁶ Merckelbach H, a Campo JA, Hardy S, Giesbrecht T. Dissociation and fantasy proneness in psychiatric patients: a preliminary study. *Comprehensive Psychiatry* 2005;46:181-85.
- ⁷ Yu JH, Ross CA, Keyes BB, Li Y, Dai YF, Zhang TH, Wang LL, Fang Q, Xiao ZP. Dissociative disorders among Chinese inpatients diagnosed with schizophrenia. *Journal of Trauma and Dissociation* 2010;11:358-72.
- ⁸ Tyler K, Cauce AM, Whitbeck LB. Family risk factors and prevalence of dissociative symptoms among homeless and runaway youth. *Child Abuse & Neglect* 2004;28:355-66.
- ⁹ Spiegel D, Loewenstein RJ, Lewis-Fernández R, Sar V, Simeon D, Vermetten E, Cardeña E, Dell PF. Dissociative disorders in DSM 5. *Depression and Anxiety*

2011;28:824-54.

¹⁰ Hageñaars MA, Fisch I, van Minnen A. The effect of trauma onset and frequency on PTSD-associated symptoms. *Journal of Affective Disorders* 2011;132:192-99.

¹¹ Levitan HL (1967). Depersonalization and the dream. *The Psychoanalytic Quarterly* 1967;36:157-71.

¹² Watson D. Dissociations of the night: Individual differences in sleep-related experiences and their relation to dissociation and schizotypy. *Journal of Abnormal Psychology* 2001;110:536-535.

¹³ Giesbrecht, Smeets, Leppink, Jellic, & Merckelbach, 2007

¹⁴ Van der Kloet, D., Lynn, S.J., Giesbrecht, T., Merckelbach, & de Zutter, A. (2011). Sleep normalization and decrease in dissociative experiences: Evaluation in an inpatient sample. *Journal of Abnormal Psychology*, Advance online publication. doi: 10.1037/a0024781.

¹⁵ Koffel, E., & Watson, D. (2009). Unusual sleep experiences, dissociation, and schizotypy: Evidence for a common domain. *Clinical Psychological Review*, 29, 548-559.

¹⁶ McNally, R. J., & Clancy, S. A. (2005). Sleep paralysis in adults reporting repressed, recovered, or continuous memories of childhood sexual abuse. *Journal of Anxiety Disorders*, 19, 595-602.

¹⁷ Levin, R., & Fireman, G. (2002). Nightmare prevalence, nightmare distress, and self-reported psychological disturbance. *Sleep*, 25, 205-212.

¹⁸ Raskind, M. A., Peskind, E. R., Hoff, D. J., Hart, K. L., Holmes, H. A., Warren, D., Shofer, J., O'Connell, J., et al. (2007). A parallel group placebo controlled study of prazosin for trauma nightmares and sleep disturbance in combat veterans with post-traumatic stress disorder. *Biological Psychiatry*, 61, 928-934.

¹⁹ Harvey, A. G., Tang, N. K. Y., & Browning, L. (2005). Cognitive approaches to insomnia. *Clinical Psychology Review*, 25, 593-611.

²⁰ Bernstein, E. M., & Putnam, F.W. (1986). Development, reliability and validity of a dissociation scale. *Journal of Nervous and Mental Disease*, 174, 727-735.

²¹ Van IJzendoorn, M. H., & Schuengel, C. (1996). The measurement of dissociation in normal and clinical populations: Meta-analytic validation of the Dissociative Experience Scale (DES). *Clinical Psychology Review*, 16, 365-382.

- ²² Derogatis, L. R. (Ed) (1994). *Symptom Checklist-90-Revised: Administration, Scoring and Procedures Manual* (3rd ed.). Minneapolis (MN): National Computer Systems.
- ²³ Arrindell, W. A.m & Ettema, H. (1981). Dimensionele structuur, betrouwbaarheid en validiteit van de Nederlandse bewerking van de Symptom Checklist (SCL-90): Gegevens gebaseerd op een fobischen een "normale" populatie. *Nederlands Tijdschrift voor de Psychologie en haar Grensgebieden*, 36, 77-108.
- ²⁴ Watson, D. (2003). To dream, perchance to remember: individual differences in dream recall. *Personality and Individual Differences*, 34, 1271-1286.
- ²⁵ Buysse, D. J., Reynolds III, C. F., Monk, T. H., Berman, S. R., & Kupfer, D. J. (1988). The Pittsburgh sleep quality index: A new instrument for psychiatric practice and research. *Psychiatry Research*, 28, 193-213.
- ²⁶ Van Even, P. (2004). *Een psychometrisch onderzoek naar de BISQ (Brussels Indices of Sleep Quality), een nieuwe methode om slaapkwaliteit te kwantificeren*. Master thesis (promotor Prof. dr. R. Cluydts). Vrije Universiteit Brussel, september 2004.
- ²⁷ Nijenhuis, E.R.S., Van der Hart, O., & Kruger, K. (2002). The psychometric characteristics of the Traumatic Experiences Questionnaire (TEC): first findings among psychiatric outpatients. *Clinical Psychology and Psychotherapy*, 9, 200–210.
- ²⁸ Näring, G., Nijenhuis, E.R.S. (2005). Relationships between self-reported potentially traumatizing events, psychoform and somatoform dissociation, and absorption, in two non-clinical populations. *Australian and New Zealand Journal of Psychiatry*, 39, 982–988.
- ²⁹ Goodman, L.A., Corcoran, C., Turner, K., Yuan, N., & Green, B. (1998). Assessing traumatic event exposure: general issues and preliminary findings for the Stressful Life Events Screening Questionnaire. *Journal of Traumatic Stress*, 11, 521–542.
- ³⁰ American Academy of Sleep Medicine (2007). *The AASM Manual for the Scoring of Sleep and Associated Events: Rules, Terminology and Technical Specifications*. AASM Manual for Scoring Sleep. Westchester, IL.

- ³¹ Sno, H. N., Schalken, H. F. A., Op den Velde, W., & Aarts, P. G. W. (2002). Dissociatieve verschijnselen bij patiënten op een polikliniek psychiatrie. *Tijdschrift voor Psychiatrie*, *44*, 161-172.
- ³² Putnam, F. W., Carlson, E. B., Ross, C. A., Anderson, G., Clark, P., Torem, M., Bowman, E. S., Coons, P., Chu, J. A., Dill, D. L., Loewenstein, R. J., & Braun, B. G. (1996). Patterns of dissociation in clinical and nonclinical samples. *Journal of Nervous and Mental Disease*, *184*, 673-679.
- ³³ Bernstein-Carlson, E., & Putnam, F. W. (1993). An update on the dissociative experiences scale. *Dissociation*, *6*, 19-27.
- ³⁴ Giesbrecht, T., & Merckelbach, H. (2004). Subjective sleep experiences are related to dissociation. *Personality and Individual Differences*, *37*, 1341-1345.
- ³⁵ Giesbrecht, T., & Merckelbach, H. (2006). Dreaming to reduce fantasy? – Fantasy proneness, dissociation, and subjective sleep experiences. *Personality and Individual Differences*, *41*, 697-706.
- ³⁶ Soffer-Dudek, N., & Shahar, G. (2011, March 28). Daily stress interacts with trait dissociation to predict sleep-related experiences in young adults. *Journal of Abnormal Psychology*. Advance online publication. doi: 10.1037/a0022941
- ³⁷ Bremner, J.D. (2010). Cognitive Processes in Dissociation: Comment on Giesbrecht et al. (2008). *Psychological Bulletin*, *136*, 1-6.
- ³⁸ Levin R, Nielsen TA (2007) Disturbed dreaming, posttraumatic stress disorder, and affect distress: A review and neurocognitive model. *Psychological Bulletin*, *133*, 482 -528.
- ³⁹ Thalbourne, M. A., & Houran, J. (2000). Transliminality, the Mental Experience Inventory and tolerance of ambiguity. *Personality and Individual Differences*, *28*, 853-863
- ⁴⁰ Soffer-Dudek N, Shahar G (2009) What are sleep-related experiences? Associations with transliminality, psychological distress, and life stress. *Consciousness & Cognition*, *18*, 891-904.
- ⁴¹ Walker en van der Helm 2009
- ⁴² Crick, F., & Mitchison, G. (1995). REM-sleep and neural nets. *Behavioural Brain Research*, *69*, 147-155
- ⁴³ LaVia, M.C., & Brewerton, T. D. (1996). Cataplexy and the switch process of multiple personality disorder. *Psychiatry Research*, *63*, 231-232.

Table 1

Mean scores and Pearson product-moment correlations between self-report measures ($N = 45$).

	<i>Mean (SD)</i>	<i>DES</i>	<i>SCL-90</i>	<i>ISES</i>	<i>PSQI</i>
<i>DES</i>	14.23 (8.56)	-	-	-	-
<i>SCL-90</i>	165.44 (46.43)	0.51**	-	-	-
<i>ISES</i>	44.98 (20.01)	0.40**	0.37*	-	-
<i>PSQI</i>	21.78 (7.75)	0.40**	0.48**	0.47**	-
<i>TEC</i>	2.67 (2.46)	0.10	0.39**	0.49**	0.30*

Note. DES = Dissociative Experiences Scale; SCL-90 = Symptom Checklist 90; ISES = Iowa Sleep Experiences Survey; PSQI= Pittsburgh Sleep Quality Index; TEC = Traumatic Experiences Checklist

* $p < 0.05$

** $p < 0.01$

Table 2

Pearson product-moment correlations between self-report measures and sleep parameters ($N = 45$).

	<i>DES</i>	<i>SCL-90</i>	<i>ISES</i>	<i>PSQI</i>	<i>TEC</i>
% sleep efficiency	0.27	0.14	0.21	-0.09	0.24
Sleep onset	-0.05	0.02	0.04	0.09	-0.12
WASO	-0.32*	-0.21	-0.26	-0.01	-0.26
Total REM	0.26	0.22	0.34*	0.05	0.20
% REM SPT	0.31*	0.19	0.23	0.03	0.06
% S1 SPT	-0.12	-0.04	0.11	0.19	0.26
ECG	0.22	0.26	0.41**	0.38*	0.29

Note. DES = Dissociative Experiences Scale; SCL-90 = Symptom Checklist 90; ISES = Iowa Sleep Experiences Survey; PSQI= Pittsburgh Sleep Quality Index; TEC = Traumatic Experiences Checklist; Sleep onset = sleep onset latency in minutes; WASO = wake after sleep onset, percentage awake during the whole sleep period (SPT = sleep period time); Total REM = total REM sleep in minutes; % REM SPT = percentage REM sleep during the whole sleep period; % S1 SPT = percentage Stage 1 sleep during sleep period time; ECG = mean score on electrocardiogram.

* $p < 0.05$

** $p < 0.01$