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# Absorbed in sleep: Dissociative absorption as a predictor of sleepiness following sleep deprivation in two high-functioning samples <sup>☆</sup>



Nirit Soffer-Dudek <sup>a,\*</sup>, Leah Shelef <sup>b</sup>, Idit Oz <sup>b</sup>, Anna Levkovsky <sup>b</sup>, Ifaat Erlich <sup>b</sup>, Shirley Gordon <sup>b,c</sup>

<sup>a</sup> The Consciousness States and Psychopathology Laboratory, Department of Psychology, Ben-Gurion University of the Negev, Beer-Sheva 8410501, Israel

<sup>b</sup> Israel Defense Force Medical Corps, Tel Hashomer, Ramat-Gan, Israel

<sup>c</sup> Department of Psychology, Ben-Gurion University of the Negev, Beer-Sheva 8410501, Israel

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## ABSTRACT

In recent years, a labile sleep-wake cycle has been implicated as a cause for dissociative experiences, and studies show that dissociation is elevated following sleep deprivation. Dissociative individuals may find it harder to regulate sleepiness in the face of sleep disruption. Although there is significant variability in reactions to sleep deprivation, research on trait predictors is scarce. The present study examined the ability of trait dissociation to prospectively predict sleepiness following sleep loss and recovery sleep. Two high-functioning samples, namely, Remotely Piloted Aircraft officers ( $N = 29$ ) and Air Force jet pilots ( $N = 57$ ) completed state and trait questionnaires assessing sleep and dissociation before and after full or partial sleep loss. Dissociative absorption was a consistent predictor of an increase in sleepiness following sleep loss and following recovery sleep, controlling for baseline sleepiness levels. We discuss the findings in light of a difficulty to regulate and monitor consciousness states.

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## 1. Introduction

Sufficient sleep is essential for optimal cognitive, emotional, and psychomotor functioning (Maquet, 2001; Pilcher & Huffcutt, 1996; Stickgold, 2005). Acute sleep deprivation or chronic partial sleep restriction result in fatigue and sleepiness, deteriorated mood, impairment in cognitive and behavioral functioning, and increased accident-proneness (e.g., Alhola & Polo-Kantola, 2007; Philibert, 2005; Philip et al., 2004; Pilcher & Huffcutt, 1996). Nevertheless, some individuals are required to function optimally under acute or chronic sleep loss conditions, at times with high responsibility and risk for the individual or their surroundings, including physicians, drivers, and security and military officers, such as aviators and Remotely Piloted Aircraft (RPA) officers.

There are substantial trait-like interindividual differences in responses to sleep loss, even after taking age and gender into account; it seems that some people are more vulnerable to the effects of sleep loss than others (Alhola & Polo-Kantola, 2007;

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\* Corresponding author.

E-mail addresses: [soffern@bgu.ac.il](mailto:soffern@bgu.ac.il) (N. Soffer-Dudek), [Lshelef4@gmail.com](mailto:Lshelef4@gmail.com) (L. Shelef), [idotoz@zahav.net.il](mailto:idotoz@zahav.net.il) (I. Oz), [anna.levkovsky@gmail.com](mailto:anna.levkovsky@gmail.com) (A. Levkovsky), [drshoahm@gmail.com](mailto:drshoahm@gmail.com) (I. Erlich), [shirley.gordon@gmail.com](mailto:shirley.gordon@gmail.com) (S. Gordon).

Doran, Van Dongen, & Dinges, 2001; Van Dongen, Baynard, Maislin, & Dinges, 2004). Among populations required to perform optimally under sleep loss conditions, it would be useful to recognize in advance those who will experience the most sleepiness and fatigue following sleep deprivation. It was found that those more susceptible to fatigue following sleep loss exhibit increased prefrontal cortex activation during calm wakefulness (Chuah, Venkatraman, Dinges, & Chee, 2006), and steeper slopes of deterioration in functioning (Chandler, Arnold, Phillips, & Turnmire, 2013). Nevertheless, attempts to prospectively identify interindividual trait risk for the detrimental effects of sleep loss are scarce. In recent years, the altered-consciousness trait of dissociation has been related to sleep abnormalities, as will be discussed below; thus, the present study aims to explore its utility as such a predictor.

Dissociation is a disruption of, or discontinuity in, the normal integration of consciousness (American Psychiatric Association, 2013). This may refer to discontinuity in identity and memory, as in dissociative identity disorder and dissociative amnesia, or to discontinuity in perception and body representation, as in depersonalization/derealization disorder. Depersonalization and derealization, in which the self or the world—respectively—are experienced as unfamiliar or altered in some way, is a rather common symptom (Michal et al., 2009). Another common dissociative process is absorption and imaginative involvement (Carlson & Putnam, 1993). Dissociative absorption is the tendency to involuntarily narrow one's attention to the point where one is oblivious to the surroundings (Soffer-Dudek, Lassri, Soffer-Dudek, & Shahar, 2015). It involves a temporary lack of reflective consciousness (Butler, 2006), which means that the individual may act automatically while imagining vividly, bringing about confusion between reality and fantasy. Absorption has been considered as “nonpathological” dissociation, i.e., an altered consciousness trait not necessarily indicative of psychopathology (Kihlstrom, 2005). Notably, however, while absorption is indeed prevalent, it seems to be relevant to psychopathology and especially to obsessive-compulsive symptoms (Soffer-Dudek, *in press*; Soffer-Dudek et al., 2015).

In recent years, it has been demonstrated that dissociative symptoms significantly increase following one night of sleep deprivation (Giesbrecht, Smeets, Leppink, Jelicic, & Merckelbach, 2007; Selvi, Kiliç, Aydin, & Güzel Özdemir, 2015; van Heugten-van der Kloet, Giesbrecht, & Merckelbach, 2015). In addition, psychiatric inpatients whose sleep improved showed a parallel decrease in dissociative symptoms (van der Kloet, Giesbrecht, Lynn, Merckelbach, & de Zutter, 2012). This body of literature grew from the conceptualization of dissociation as sleep elements entering the waking state, due to labile sleep-wake boundaries (Koffel & Watson, 2009; Mahowald & Schenck, 2001; van der Kloet, Merckelbach, Giesbrecht, & Lynn, 2012). For example, dissociative (psychogenic) amnesia and dissociative disorientation in space and time may be conceptualized as a hybrid state between waking and non-REM sleep, similar to sleep-walking (Mahowald & Schenck, 2001; Schenck, Milner, Hurwitz, Bundlie, & Mahowald, 1989). Indeed, non-clinical high dissociators demonstrated increased theta and delta power and decreased alpha power at waking baseline (Giesbrecht, Jongen, Smulders, & Merckelbach, 2006). In addition, dissociation is related to unusual sleep experiences conceptualized as aroused sleep (Soffer-Dudek & Shahar, 2011). Moreover, in individuals with insomnia, dissociation scores were related to aroused sleep (represented by a high percentage of Rapid Eye Movement (REM) sleep), alongside less time spent awake during the night (Van Der Kloet et al., 2013). The notion that arousal was endured within sleep, rather than waking up the sleeper, is in keeping with the conceptualization of dissociation as a tendency towards mixed sleep-wake states.

The notion that dissociative individuals tend to linger in mixed sleep-wake states raises the hypothesis that they may find it harder to regulate their sleepiness following sleep loss. To the best of our knowledge, while several studies showed that sleep loss brings about dissociation, only one study attempted to explore dissociation as an individual differences trait which may predict increased sleepiness following sleep deprivation (van Heugten-van der Kloet et al., 2015). In that study, baseline trait dissociation scores were unrelated to change in sleepiness across the sleep-deprived night. However, sleepiness in that study was assessed with just a single item. In addition, although dissociation is a multifaceted phenomenon (Holmes et al., 2005; Soffer-Dudek, 2014), van Heugten-van der Kloet and colleagues did not attempt to explore the relationship of specific dissociative subscales to sleepiness, and specifically, absorption.

Dissociative absorption is the most common type of dissociation (Butler, 2006), and has raised interest and controversy regarding its existence as a unique dissociative factor and its relation to psychopathology (Soffer-Dudek et al., 2015). Yet, its relevance to sleepiness, as compared to the other dissociation factors, has not been explored to date. Individuals characterized by dissociative absorption tend to be unaware of their surroundings, fail in monitoring reality and imagination, and may, at times, stare blankly into space without noticing the passage of time. It seems that they find it difficult to regulate attentional and consciousness states, resulting in immersion in vivid imagination, and automatic actions. Thus, we hypothesized that individuals characterized by dissociative absorption may find it particularly difficult to regulate their sleepiness and monitor their waking functioning in the face of sleep loss. In addition, the idea that dissociative individuals find it difficult to regulate transitions between sleeping and waking states also leads to the hypothesis that they may find it harder to recover from sleep loss. Possibly, any irregularity in their sleep schedule may be harder to manage. Previous studies did not attempt to explore whether dissociation is related to sleepiness following recovery sleep, which was another aim of the present study.

To conclude, the present study set out to: (1) replicate previous studies showing an increase in state dissociation following sleep loss; (2) explore trait dissociation (total score and subscale scores) to attempt to prospectively-longitudinally predict sleepiness following sleep loss; and (3) explore whether dissociation may also predict sleepiness following recovery sleep. Notably, the present study has two major strengths: (1) the utilization of two separate samples, both high-functioning

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