

INTROVERSION, TYPE A PERSONALITY, AND RESILIENCE TO COGNITIVE IMPAIRMENT FROM SLEEP LOSS

Stacey R. Webber, Megan R. Sherman, Adrienne M. Tucker, Gregory Belenky,
and Hans P.A. Van Dongen

Sleep and Performance Research Center
Washington State University, Spokane, WA, USA

INTRODUCTION

It has been demonstrated that inter-individual differences in resilience to cognitive impairment from sleep deprivation constitute a trait¹. Several groups have begun to search for predictors of this trait by looking at, among other things, different aspects of personality. Recently, introversion was claimed to predict psychomotor vigilance test (PVT) responses to sleep deprivation^{2,3}. Another personality trait of potential interest is Type A behavior. Given the sense of urgency and dedication to work associated with Type A individuals, such persons may be prone to reduce their sleep and extend daytime activities into the night. Here, we investigated Introversion/Extraversion and Type A personality as candidate personality predictors of resilience to performance impairment from sleep deprivation. We utilized data from one of the only two studies to date designed to examine the trait component of inter-individual differences in cognitive responses to sleep loss^{1,4}.

METHODS

As part of a larger study⁴, 20 healthy young adults (age 22–40; 11 females) spent eleven consecutive days in a sleep laboratory. They were exposed to three 36 h total sleep deprivation periods. Each sleep deprivation period was preceded and followed by two extended nighttime sleep opportunities (12 h time in bed) to recuperate from prior sleep debt. During two of the three sleep deprivation periods, every 2 h subjects completed a 30 min. neurobehavioral performance battery including a 10 min PVT. The number of lapses (reaction time > 500ms) for every test bout was averaged within subjects across the last 24h of each of these two sleep deprivation periods. Thus, there were two estimates of cognitive impairment per subject.

Prior to the experiment, subjects filled out the Eysenck Personality Questionnaire (EPQ)⁵ and the Myers Briggs Type Indicator (MBTI)⁶. These two tests both yielded introversion/extraversion (I/E) scores that were separately analyzed against the PVT responses. Subjects also filled out the Survey of Work Styles (SWS)⁷, which yielded a global Type A personality score. The relationship between these personality scores and the subjects' PVT responses was assessed with mixed-effects analysis of covariance.

RESULTS

In agreement with findings from an earlier study¹, systematic inter-individual differences in cognitive impairment from sleep deprivation were observed. Figure 1 illustrates this trait-like inter-individual variability, showing that the responses to sleep deprivation differed substantially between individuals while they were relatively stable within individuals.

Table I shows the means and standard deviations for EPQ I/E and SWS Type A personality scores, which in this sample were similar to published norms^{7,8}. No quantitative norms appear to have been published for the MBTI.

No significant relationships were observed between PVT lapses during sleep deprivation and I/E scores as measured on the EPQ ($r = -0.09$, $F_{1,19} = 0.19$, $P = 0.66$) or the MBTI ($r = -0.04$, $F_{1,19} = 0.04$, $P = 0.84$), see Figure 2. In addition, no significant relationship was found between PVT lapses during sleep deprivation and Type A personality scores on the SWS ($r = 0.16$, $F_{1,19} = 0.24$, $P = 0.63$), see Figure 3.

When EPQ I/E and SWS Type A scores were entered into mixed-effects analysis of covariance simultaneously, trends towards significance emerged (I/E: $F_{1,19} = 3.04$, $P = 0.097$; Type A: $F_{1,19} = 3.50$, $P = 0.076$; Interaction: $F_{1,19} = 3.23$, $P = 0.087$). However, the interaction of EPQ I/E and SWS Type A was only marginally correlated with PVT lapses ($r = -0.08$). No statistical significance or trends were seen when MBTI I/E and SWS Type A scores were analyzed as covariates together.

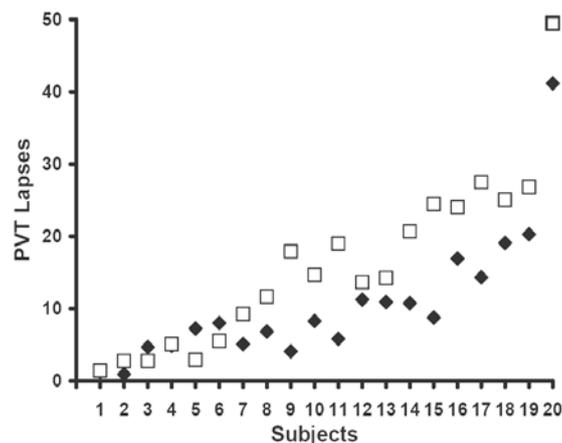


Figure 1. Psychomotor vigilance test (PVT) lapses averaged over the last 24h in the first (black diamonds) and second (white boxes) exposures to 36h sleep deprivation with 10min PVT testing every 2h. The two averages for PVT lapses (ordinate) are plotted for the individual subjects (abscissa). The subjects are ordered by the overall magnitude of impairment (as averaged over the two sleep deprivations), with the more resilient subjects on the left and the more vulnerable subjects on the right. The two data points for subjects 1 and 4 are overlapping.

Table 1. Observed scores and published norms (mean \pm standard deviation) for the Eysenck Personality Questionnaire (EPQ) introversion/extraversion scale⁸ and the Survey of Work Styles (SWS) Type A personality scale.⁷

Scale	Observed in study	Published norm
EPQ	15.7 \pm 4.8	14
SWS (females)	87.3 \pm 14.6	94.4 \pm 16.2
SWS (males)	95.2 \pm 9.3	98.4 \pm 15.3

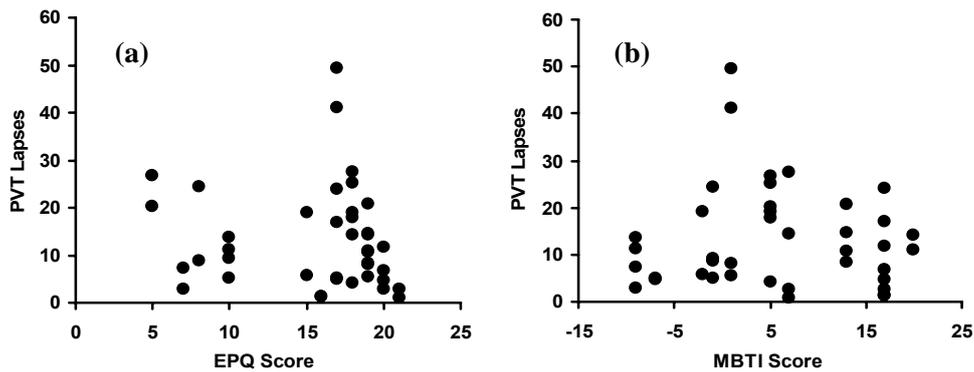


Figure 2. Eysenck Personality Questionnaire (EPQ) scores (panel a) and Myers Briggs Type Indicator (MBTI) scores (panel b) for introversion/extraversion plotted against PVT lapses as observed during sleep deprivation. Each subject contributed two PVT data points (one 24h average for each sleep deprivation period).

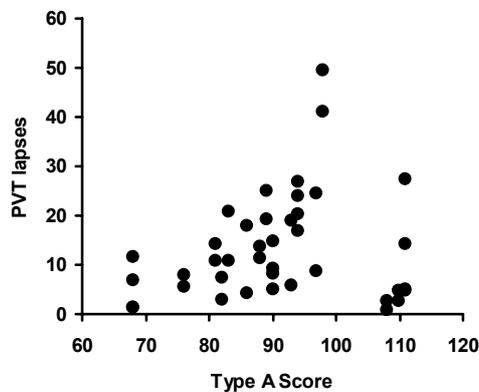


Figure 3. Survey of Work Styles (SWS) Type A personality scores plotted against PVT lapses as observed during sleep deprivation. Each subject contributed two data points (see Figure 2).

DISCUSSION

The identification of predictive markers of resilience to cognitive impairment from sleep loss is hampered by a lack of knowledge about the underlying mechanisms. Without theoretical guidance and statistical safeguards, there is an elevated risk of chance findings, and replication of findings becomes especially important. Our results did not support the recent claim that introversion predicts resilience to cognitive impairment from sleep loss^{2,3}. In the only other study to date specifically examining the trait aspect of inter-individual differences in cognitive responses to sleep loss¹, introversion/extraversion similarly failed to predict individuals' responses to sleep deprivation⁹. This highlights the importance of examining the generalizability of candidate markers of resilience to sleep deprivation before accepting them as established predictors.

We also found no evidence that Type A personality is associated with resilience to performance impairment from sleep loss. Thus, while extending wakefulness into the night may be particularly attractive for Type A individuals in order to gain productive time, in general these individuals appear to be no less vulnerable to performance deficits resulting from sleep loss than others. Considering the documented mismatch between the magnitude of performance impairment and the level of sleepiness experienced subjectively while deprived

of sleep^{1,10,11}, this is of concern for people whose personality may drive them to stay awake through the night.

ACKNOWLEDGMENTS

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