# The relative impact of trait and temporal determinants of subjective fatigue

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## ARTICLE INFO

## ABSTRACT

Personality, time of day, and day of the week were assessed as predictors of state fatigue. After completing an in-lab questionnaire, 172 participants ($N = 172$) reported their state subjective fatigue three times a day for 8 days. Trait neuroticism, conscientiousness, positive affect, and negative affect were predictive of aggregate state subjective fatigue at different points in the day and over the course of the study. Results indicated mean differences in subjective fatigue at different points in the day and week. Personality traits displayed incremental validity over time and day in predicting subjective fatigue states. Multilevel analyses demonstrated that personality traits have an impact on both between individual and within individual sources of state fatigue variance. The relative contribution of personality traits to state subjective fatigue is discussed.

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## 1. Introduction

Subjective fatigue refers to a perceived state of "a pervasive sense of tiredness or lack of energy that is not related exclusively to exertion" (Brown & Schutte, 2006, p.585). Several theoretical perspectives suggest that fatigue be viewed as a process of the depletion and replenishment of renewable resources (Hockey, 1997; Zijlstra & Sonnentag, 2006), such as energy (Hobfoll, 1989). In general, studies of subjective fatigue in non-clinical populations have often been designed primarily to assess temporal factors, such as time of day (Griffith, Kerr, Mayo, & Topal, 1950) or day of the week (Nelson & Ladan, 1976). Taking account of the cross-situational consistency which characterizes personality traits will likely enhance the prediction of fatigue beyond that which is gained by more transient temporal states. Several personality traits hypothesized to be predictors of subjective fatigue over the course of the day and days of the week are described below.

### 1.1. Neuroticism

Neuroticism refers to a tendency to experience negative distressing emotions (Merkelbach, König, & Sittinger, 2003), combined with psychological tendencies to perceive threat (Schneider, 2004). Interestingly, task-based studies have linked neuroticism to various indicators of fatigue, both before and after performance of a fatiguing task (Ackerman & Kanfer, 2009; Matthews & Desmond, 1998). Furthermore, several studies have looked at temporal fluctuations in fatigue and state affect in people reporting high

levels of neuroticism. For example, past research has associated neuroticism with tendencies to experience evening negative affect peaks (Rustings & Larsen, 1998) and night-shift fatigue-inertia ratings (Bohle & Tilley, 1993). These studies indicate that neurotic individuals are sensitive to resource loss during the day, ultimately leading to an unpleasant mood at the end of the day. Combining this loss-sensitivity with cognitive predispositions to ruminate and worry (Muris, Roelofs, Rassin, Franken, & Mayer, 2005), it is possible that higher levels of neuroticism put people in a cycle of insufficient recovery, stemming from an inability to detach from the events of the day (Sonnentag & Fritz, 2007). Both loss sensitivity and impaired recovery may lead people with high levels of neuroticism to consistently feel more fatigued. Accordingly, the current study predicts a positive relationship between neuroticism and fatigue at all points of the day and week (Hypothesis 1).

### 1.2. Conscientiousness

Conscientiousness reflects facets of order, dutifulness, achievement striving, self-discipline, and deliberation (McCrae & John, 1992). Although conscientiousness has been understudied as a predictor of fatigue to date, this trait is particularly interesting as there are two disparate pathways through which conscientiousness may predict subjective fatigue. From a limited resource framework (Hobfoll, 1989), it is possible that conscientious individuals will feel more fatigued due to greater energy and effort expenditure during task and work performance situations. The contrasting view suggests that individual difference variables, such as conscientiousness (Halbesleben, Harvey, & Bolino, 2009), can themselves be viewed as personal resources (Grandey & Cropanzano, 1999). Studies linking conscientiousness to work engagement (Kim, Shin,

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& Swanger, 2009), active coping strategies (Connor-Smith & Flachs-bart, 2007), and well-being (Keyes, Shmotkin, & Ryff, 2002) support this reasoning. Additionally, research has indicated that positive outcomes associated with conscientiousness may be part of a positive gain spiral whereby engagement, which is partially characterized by feelings of vigor (Schaufeli, Salanova, González-Romá, & Bakker, 2002), fosters additional job related resources which lead to future engagement (Hakanen, Perhoniemi, & Toppinen-Tanner, 2008). Viewing conscientiousness as a personal resource, it should be the case that higher levels of conscientiousness buffer the impact of fatiguing variables on the experience of subjective fatigue over the course of the day and week (Hypothesis 2).

### 1.3. Positive and negative affect

In general, positive affect (PA) reflects tendencies to feel enthusiastic, active, and alert, while negative affect (NA) reflects subjective distress and various aversive mood states (Watson, Clark, & Tellegen, 1988). Higher levels of trait PA are often associated with lower levels of a number of negative well-being outcomes, including exhaustion (Zellars, Perrewé, Hochwarter, & Anderson, 2006) and stress (Kaplan, Bradley, Luchman, & Haynes, 2009). In contrast, a positive correlation has consistently been demonstrated between trait NA and negative well-being outcomes, such as exhaustion (Zellars et al., 2006) and poor general well-being (Fritz & Sonnentag, 2005). Viewed in terms of recovery related processes, people reporting higher PA are likely to engage in more positive work reflection, while people reporting higher NA are likely to engage in more negative work reflection. Given the relationship between work reflection, fatigue, and recovery (Binnewies, Sonnentag, & Mojza, 2009; Fritz & Sonnentag, 2006), this line of reasoning suggests that trait PA will be associated with reduced subjective fatigue (Hypothesis 3), while trait NA will be predictive of elevated subjective fatigue (Hypothesis 4) over the course of the day and week.

## 2. Method

### 2.1. Participants

Participants were recruited from undergraduate psychology courses at a southern U.S. university. To be eligible to participate, participants had to be native English speakers, have access to a laptop computer during the day and in the evenings, and have at least one class every weekday. A total of 177 individuals meeting these criteria agreed to participate in the study. There were 3405 out of 4248 possible state subjective fatigue questionnaires completed by these 177 participants (response rate = 80.2%).[1] Two outliers were excluded for scoring 3 standard deviations below and above the mean on trait PA and NA, respectively. Another three participants were excluded for failing to complete any state fatigue measures at bedtime. Therefore, the sample consisted of 172 participants.

### 2.2. Procedure

Participants came to an in-lab session on a Saturday morning to complete a questionnaire assessing several personality traits. After completing the questionnaire, participants received instructions to access and complete an online state fatigue scale three times a day for an 8-day period. The 8-day period began the Monday morning after their laboratory session and ended at bedtime of the following Monday. Participants were instructed to access and complete

the online scale: (a) upon waking (morning), (b) between 4 p.m. and 7 p.m. (early evening), and (c) between 9 p.m. and midnight (bedtime). Computer software time stamped each completed state fatigue questionnaire.

In order to include as many complete questionnaires as possible, state fatigue measurements completed outside of the indicated time intervals were assigned to the nearest appropriate time interval whenever possible. Since the "upon waking" time point did not have a specific time window, analysis of compliance with the state fatigue reporting instructions had to be restricted to early evening and bedtime time points. As Little's (1988) MCAR test indicated that data could be assumed missing completely at random ($\chi^2$ (3338) = 3360.49, n.s.), compliance analysis focused on completed questionnaires. Compliance results indicated 90 out of 1023 (8.8%) early evening questionnaires were 1 min or more outside of the indicated time window, while 126 out of 1080 (11.7%) bedtime questionnaires met this criterion. However, non-compliant questionnaires were generally close to the instructed time windows (average deviation = 42 min), although 37 (3.4%) bedtime time points were recorded which fell 1 hr or more after midnight. As the third daily time point represented bedtime fatigue, it was deemed appropriate that these non-compliant data be included in subsequent analyses.

### 2.3. Measures

#### 2.3.1. In-lab questionnaire measures

Trait neuroticism was assessed using the 23 item neuroticism subscale of the Eysenck Personality Questionnaire (EPQ-N; Eysenck & Eysenck, 1975), and the 20 item neuroticism subscale of the International Personality Item Pool-NEO (IPIP; International Personality Item Pool, 2008). Two items from the EPQ-N were removed due to overlap with the construct of fatigue. For both scales, participants indicated the degree to which they felt each statement was true or untrue of them on a Likert-type scale ranging from 1 (*Very UNTRUE of me*) to 6 (*Very TRUE of me*). The EPQ and IPIP neuroticism subscales were summed into a total score. The internal consistency of the combined scale was high ($\alpha$ = .95).

Trait conscientiousness was assessed using a 20 item scale from the IPIP-NEO. Participants responded using a scale ranging from 1 (*Very UNTRUE of me*) to 6 (*Very TRUE of me*). The internal consistency of this measure was high ($\alpha$ = .91).

PA and NA were assessed using the positive and negative affect schedule (PANAS; Watson et al., 1988), which contains 10 adjectives associated with PA and 10 adjectives associated with NA. Participants were asked to indicate the extent to which each adjective describes the way they generally feel on a scale ranging from 1 (*Very slightly or not at all*) to 5 (*Extremely*). Internal consistency estimates for both scales were acceptable (PA $\alpha$ = .81, NA $\alpha$ = .78).

#### 2.3.2. State fatigue

Participants completed an online adapted measure combining 11 items from the Chalder et al. (1993) fatigue scale (CFS) with five items from the checklist of individual strength (CIS; Vercoulen et al., 1994) three times per day. Three items from the CFS were not included because they tapped more clinical symptoms of fatigue. To shorten the state fatigue measure, only five items from the CIS subjective fatigue scale were included. The excluded items were already largely represented by CFS items. Items from these trait fatigue measures were altered to reflect state fatigue. A sample alteration is changing the original item of "I have problems thinking clearly" to "I am having problems thinking clearly." Participants responded to these items in terms of how they currently felt on a scale ranging from 1 (*Strongly Disagree*) to 6 (*Strongly Agree*).

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[1] Similar results were obtained using several different approaches to account for missing data. Reported analyses were conducted on the data set with missing values.