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Fatigue: relationships with basic personality and temperament dimensions

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Abstract

This study examined the relationships between the Five-Factor-Model (FFM) personality dimensions (Extraversion, Agreeableness, Conscientiousness, Emotional Stability, Openness/Autonomy), the Pavlovian temperament variables (Strength of Excitation, Strength of Inhibition, Mobility), and fatigue. We expected that all these person characteristics would be negatively associated with fatigue. In a survey among persons working at least 20 h a week ($N=765$), respondents completed a personality questionnaire (the Five-Factor Personality Inventory), a temperament scale (the Pavlov Temperament Survey), and two fatigue questionnaires (the Checklist Individual Strength-20 and the Emotional Exhaustion scale of the Maslach Burnout Inventory). Results indicated that high scores on Autonomy, and low scores on Extraversion, Conscientiousness, Emotional Stability, and Strength of Excitation were, in various combinations, predictors of higher fatigue scores. Agreeableness, Strength of Inhibition, and Mobility did not play a role in the prediction of any fatigue score. In conclusion, personality and temperament dimensions explained significant proportions of the variance in fatigue. It is stated that there is an urgent need for longitudinal studies in order to examine the predictive value of the personality dimensions over time. © 2002 Elsevier Science Ltd. All rights reserved.

Keywords: Personality; Temperament; Big five; Fatigue; Emotional exhaustion

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1. Introduction

Fatigue is one of the major complaints in primary care settings (e.g. Bates et al., 1993; Bensing, Hulsman, & Schreurs, 1996; Fuhrer, 1994; Lewis & Wessely, 1992; Mann, McDonald, Cope, Pelosi, & David, 1994). Also in general population studies, prolonged fatigue is commonly reported (14–22%; e.g. Chen, 1986; Loge, Ekeberg, & Kaasa, 1998). In an extensive study, it was found that about 25% of Dutch employees report fatigue at work (CBS, 1999). In another Dutch study, it could be demonstrated that psychosocial problems played a direct role in disablement and absence through illness in about 30% of the cases. Using an inventory of health complaints that lead to absence of work and disability, it appeared that long-term mental fatigue and burn-out played an important role in about 90% of the cases (Rycken, 1997).

In spite of the fact that fatigue is a very common symptom, most people do not feel tired regularly. Furthermore, only a minority of the persons who report fatigue symptoms indicate that this is a reason to visit their physician. For instance, although more than 40% of the respondents in the study by Fuhrer (1994) reported fatigue symptoms, only 7.6% of the respondents said that fatigue was the main reason for seeing their general practitioner. This discrepancy has been explained in terms of attribution of fatigue to sleep disturbance (duration and quality), work, and stress (e.g. Frone & Russell, 1995). However, it might be that the discrepancy is also caused in part by personality and temperament factors.

A review of the relationship between personality and work-related fatigue has suggested a positive relationship between neuroticism and fatigue, including emotional exhaustion, and a negative association between extraversion and fatigue. High-scorers on neuroticism tend towards heightened perception of fatigue symptoms, whereas extraverts are inclined to under-report fatigue symptoms (e.g. Bohle & Tilley, 1993; De Vries & Van Heck, 2000, submitted for publication; May & Kline, 1988). This outcome is in line with the fact that neuroticism, by definition, is related to more frequent and intense experience of negative emotional states (Williams & Wiebe, 2000). With regard to agreeableness, conscientiousness, and openness to experience, it can be concluded that only a few studies examining emotional exhaustion have incorporated these personality dimensions. In two studies, negative associations were found between agreeableness and emotional exhaustion (Mills & Huebner, 1998; Piedmont, 1993). Concerning a possible relationship between emotional exhaustion and conscientiousness inconsistent results have been reported (Deary, Agius, & Sadler, 1996; Mills & Huebner, 1998). No associations have been found between openness to experience and emotional exhaustion (Deary et al., 1996; Piedmont, 1993). Furthermore, virtually nothing is known about the relationship between temperament and fatigue (De Vries & Van Heck, submitted for publication). In the only study in which temperament was examined, a substantial negative relationship was found between strength of excitation and emotional exhaustion (Rudow & Buhr, 1986).

With respect to the quality of the existing research, it should be noted that the fatigue measures that are used in studies examining the relationship between personality/temperament and fatigue are often developed ad hoc (e.g. Byrne, 1991; De Vries & Van Heck, submitted for publication; Fromm, Melamed, Kristal-Boneh, Gofer, & Ribak, 1996; Härma, Ilmarinen, & Knauth, 1988; Iskra-Golec, Marek, & Noworol, 1995; Magnusson, Nias, & White, 1996; Martikainen, Urponen, Partinen, Hasan, & Vuori, 1992).

The personality characteristics extraversion, agreeableness, conscientiousness, neuroticism, and openness to experience/autonomy represent a taxonomy of basic personality traits, the Five-Factor Model of personality (FFM). A considerable body of research has demonstrated the summarizing power of these five factors, which are conceived of by many current trait theorists as a firm basis for an adequate representation of personality structure (e.g. Digman, 1990; McCrae & Costa, 1999; McCrae & John, 1992). Extraversion reflects the disposition towards cheerfulness, sociability, and high activity. Agreeableness represents the inclination towards interpersonal trust and consideration of others. Conscientiousness summarizes the tendency towards persistence, sense of duty, industriousness, organizing, planning, and self-discipline. Neuroticism stands for the tendency to experience distressing emotions such as fear, guilt, and frustration, while openness/autonomy points at a receptive orientation toward varied experiences and ideas (see Costa & McCrae, 1989, for more detailed descriptions of these five basic factors).

With respect to the temperament domain, this study focusses on excitation, inhibition and mobility, the features of central nervous system functioning that form the basis of Pavlov's conceptualizations of temperament (Pavlov, 1951–1952). Strength of Excitation (SE) reflects the functional capacity of the nervous system. Threatening situations do not stop high-scorers on SE from undertaking previously planned activities and actions. Furthermore, SE is reflected in a proneness to undertake activity under highly stimulating conditions and a preference for carrying out risky and/or demanding activities. Performance of activity under social and/or physical load does not evoke emotional disturbances. The performance of high-SE individuals does not decrease significantly under stressful conditions. They are resistant to fatigue, when engaging in long-lasting and/or intensive activity, and able to react adequately under strong emotional tension. Strength of Inhibition (SI) concerns learned and acquired inhibitions reflecting the ability to stop or delay given behaviour, when needed, and to refrain from behaviours and reactions. Mobility of nervous processes (MO) manifests itself in the ability to give priority to one impulse before the other, excitation before inhibition and conversely. High-scorers on MO adapt quickly to new surroundings and pass easily from one activity to another. Low-scorers respond less adequately to changes in the environment. See for a detailed description Strelau, Angleitner, and Newberry (1999). Temperament is part of the trait-oriented personality structure and can only be understood, when approached from this perspective. Traits regarded as belonging to temperament are present from early infancy, have their counterparts in animals, and are at least partly rooted in the biological background (Strelau, 1987, 2001). It speaks for itself that not all the thousands of trait descriptive terms that are discerned in trait psychology can be regarded as reflecting such a neurobiochemical individuality. Even the FFM, featuring the *basic* dimensions of personality, probably represents a mixture of non-temperamental traits and temperamental dispositions. Several authors have suggested links between the Pavlovian CNS types and prominent personality dimensions. For instance, Eysenck (1966) and Gray (1964) have pointed at a positive connection between SE and extraversion. Neuroticism too is often seen as negatively related to SE. Various studies have demonstrated these links and other associations with FFM dimensions. Strelau et al. (1999), summarizing these investigations, have concluded that the SE and MO scales correlate moderately with extraversion and that the available studies unequivocally reveal a negative relationship between neuroticism and SE, SI, and MO.

In this study, the relationships between the FFM personality dimensions, the Pavlovian temperament variables, and fatigue have been examined. Based on earlier empirical studies, it was expected that extraversion, agreeableness, and emotional stability would be negatively related to

fatigue. In addition, based on theoretical considerations, it was expected that conscientiousness, openness to experience, and the three Pavlovian-oriented temperament variables would also be negatively related to fatigue.

2. Method

2.1. Subjects

A survey among the Dutch working population was conducted to collect information on the relationship between personality and fatigue. Telephone numbers were randomly selected from the telephone directory. Participants qualified for the study if they met the criterion of having a paid job of at least 20 h a week. The questionnaires were mailed to potential participants. Of the 1599 persons who agreed to participate in the study, 821 (51%) returned a test booklet of which 765 were usable. Compared with the Dutch working population, the respondent group was an adequate representation, albeit that persons with a low education level were somewhat under-represented and persons with a high education level slightly over-represented (CBS, 1999), which is not uncommon for this type of study (Saris, 1988).

2.2. Measures

Respondents completed two personality questionnaires and two fatigue questionnaires. The personality questionnaires were the Five-Factor Personality Inventory (FFPI; Hendriks, 1997; Hendriks, Hofstee, & De Raad, 1999) and the Pavlov Temperament Survey (PTS; Strelau, Angleitner, Bantelmann, & Ruch, 1990; Dutch version by Van Heck, De Raad, & Vingerhoets, 1993a, 1993b). The fatigue questionnaires were the Checklist Individual Strength-20 (CIS-20; Vercoulen, Alberts, & Bleijenberg, 1999; Vercoulen, Swanink, Fennis, Galema, Van der Meer, & Bleijenberg, 1994), and the Emotional Exhaustion (EE) Scale from the Maslach Burnout Inventory (Original version by Maslach, Jackson, & Leiter, 1996; Dutch version, the MBI-NL by Schaufeli & Van Dierendonck, 2000). The latter two instruments were selected in order to have a broad representation of symptoms of fatigue. Comprehensiveness and high bandwidth were expected because the CIS-20 and the EE-MBI were developed in specific research areas, that is, the domains of chronic diseases and burnout, respectively.

The FFPI was used to assess the Big Five personality characteristics: extraversion, agreeableness, conscientiousness, emotional stability, and autonomy. The FFPI represents the Big Five structure generated by the lexical approach (e.g. John, Goldberg, & Angleitner, 1984). The scale consists of 100 brief and concrete statements (10 positively and 10 negatively phrased items for each of the five factors) with a five-point response scale ranging from 1 (*not at all applicable*) to 5 (*totally applicable*). The psychometric properties appear to be satisfactory (Hendriks et al., 1999). For instance, Hendriks (1997) reported internal consistencies ranging from 0.83 to 0.89, and test-retest reliabilities that ranged from 0.79 to 0.84. Also, a clear convergence was found between the FFPI factors and their corresponding domain scales of other FFM personality inventories such as the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1989, 1992; Dutch version by Hoekstra, Ormel, & De Fruyt, 1996).

The Pavlovian-oriented temperament characteristics were measured by the PTS. This questionnaire contains 60 items designed to measure strength of excitation, strength of inhibition, and mobility. Each subscale is measured by 20 items with a four-point response scale ranging from 1 (*completely uncharacteristic*) to 4 (*completely characteristic*). The internal consistency of the PTS scales is very satisfactory. In an earlier study with the Dutch version of the PTS, Cronbach alpha coefficients were 0.88, 0.78, and 0.91 for SE, SI, and MO, respectively (Van Heck et al., 1993a, 1993b).

The CIS-20 consists of 20 items and measures four aspects of fatigue: subjective experience of fatigue (eight items, e.g. 'I feel tired'), reduction in concentration (five items, e.g. 'I have trouble to concentrate'), reduction in motivation (four items, e.g. 'I feel no desire to do anything'), and physical activity level (three items, e.g. 'I don't do much during the day'). Items are answered on a scale of 1 (*yes, that is true*) to 7 (*no, that is not true*). The total score can range from 20 to 140. The

Table 1
Demographic and psychological characteristics

<i>Demographic variables</i>	
Gender: female (%)	346 (45.2)
male (%)	409 (53.5)
missing (%)	10 (1.3)
Partner: no partner (%)	218 (28.5)
partner (%)	544 (71.1)
missing (%)	3 (0.4)
Education: low (%)	185 (24.2)
middle (%)	241 (31.5)
high (%)	325 (42.5)
missing(%)	14 (1.8)
Age: Mean Å S.D. (range)	40.3 Å 9.7 (18–64)
<i>Basic personality and temperament dimensions</i>	
Extraversion	71.1 ± 9.7
Agreeableness	76.5 ± 6.7
Conscientiousness	73.4 ± 7.9
Emotional Stability	77.2 ± 9.2
Autonomy	71.9 ± 7.6
Strength of Excitation (SE)	29.7 ± 6.9
Strength of Inhibition (SI)	32.4 ± 5.7
Mobility (MO)	37.1 ± 7.1
<i>Fatigue</i>	
CIS-Subjective Experience of Fatigue	22.5 ± 12.2
CIS-Reduction of Concentration	12.2 ± 6.9
CIS-Reduction of Motivation	10.1 ± 5.3
CIS-Physical Activity Level	6.6 ± 4.2
CIS-Total	51.2 ± 23.8
Emotional Exhaustion (MBI-NL)	2.5 ± 1.1

cut-off score (> 76 ; Dutch norm; Bültmann, De Vries, Beurskens, Bleijenberg, Vercoulen, & Kant, 2000) is based on the total score, which is a summation of the four aspects. Although the CIS-20 was developed initially for assessing fatigue in Chronic Fatigue Syndrome patients, the questionnaire is claimed to be applicable in healthy populations (Beurskens, Bültmann, Kant, Vercoulen, Bleijenberg, & Swaen, 2000). In this study, the internal consistency of the subscales ranged from 0.81 (Reduction in Motivation) to 0.94 (Subjective Experience of Fatigue). For the total scale the internal consistency was 0.94.

The EE Scale consists of five items (e.g. 'I feel emotionally drained due to my work'). It measures the core aspect of burnout: emotional exhaustion. Answers are given on seven-point-scales ranging from 1 (*never*) to 7 (*always*). Scores can range from 1.0 to 7.0, with a cut-off score of 3.80. The psychometric qualities are good (Schaufeli & Van Dierendonck, 2000). In this study, the internal consistency was 0.86.

Finally, some demographic data (gender, age, living with a partner or not, and educational level) was collected.

2.3. Statistical procedure

Frequencies on the personality and fatigue scales were used to present the demographic data and the scores of the respondents. *t*-Tests were employed to examine differences in gender and marital status with regard to fatigue. Pearson correlations were computed as tests of the associations among the fatigue (sub)scales and the relationships between age and fatigue. Furthermore, Pearson correlations were used to examine the relationship between personality and temperament, on the one hand, and fatigue, on the other hand. Finally, multiple regression analyses (MRA) were run with each of the fatigue (sub)scales as dependent variable. Each MRA (stepwise method) consisted of two blocks of variables. The demographic variables gender, age, educational level, and marital status were in Block 1. The second block consisted of the FFPI-Scales (with the exception of the Agreeableness Scale due to extremely low correlations between agreeableness and fatigue measures; see Table 4 in the Section 3) and the PTS-Scales.

3. Results

The demographic and psychological characteristics of the respondents are summarized in Table 1. There were more men than women in the final sample. Most of the respondents lived with a partner. The average age was 40.3 years. A large proportion of the group had a high educational level (42.5%). On average, respondents who did not live with a partner scored higher on CIS-total ($t = 2.78$; $P = 0.01$; mean score difference = 5.63) as well as on the four CIS-20 subscales: Subjective Experience of Fatigue ($t = 1.97$; $P = 0.05$; mean score difference = 1.94), Reduction of Concentration ($t = 2.59$; $P < 0.05$; mean score difference = 1.44), Reduction of Motivation ($t = 3.24$; $P < 0.01$; mean score difference = 1.46), and Physical Activity Level ($t = 3.18$; $P < 0.01$; mean score difference = 1.07). Compared with men, women reported a higher mean score on the Subjective Experience of Fatigue subscale ($t = -3.05$; $P < 0.01$; mean score difference = -2.77) and a lower mean score on the Physical Activity Level subscale ($t = 2.34$; $P < 0.05$; mean score difference = 0.72). No differences in fatigue were found with regard to age and education level.

With regard to fatigue, 16.5% of the respondents ($n=126$) scored high on the CIS-20 and approximately the same percentage of subjects (14.0%; $n=107$) scored high on the Emotional Exhaustion Scale.

Before the relationship between the basic personality dimensions and fatigue was examined, the correlations among the six fatigue (sub)scales (Table 2) and the correlations among the personality and temperament variables (Table 3) were calculated. In general, the correlations in Table 2, reflecting the associations between the various fatigue measures, were moderately high with a range from 0.32 (Physical Activity Level with Emotional Exhaustion) to 0.66 (Subjective Experience of Fatigue with Reduction of Motivation). Table 3 presents a pattern of associations that shows a strong link between Agreeableness and Conscientiousness, on the one hand, and a high interdependency of the three remaining FFM-factors (all r 's > 0.50), on the other hand. Furthermore, Strength of Excitation and Mobility appeared to be closely linked to this group of three personality traits (average correlation = 0.47 and 0.51, respectively), while Strength of Inhibition was more associated with Agreeableness and Conscientiousness (average correlation = 0.29).

Correlations between personality dimensions and fatigue are presented in Table 4. Regarding the Pavlovian temperament variables, the following pattern of relationships was found. Strength of Inhibition was unrelated to Physical Activity Level. The remaining correlations between

Table 2
Correlations among the fatigue (sub)scales

	CIS-20					MBI-NL
	SEF	ROC	ROM	PAL	TOT	EE
CIS-Subjective Experience of Fatigue	–	0.58	0.66	0.48	0.91	0.59
CIS-Reduction of Concentration		–	0.56	0.52	0.80	0.47
CIS-Reduction of Motivation			–	0.53	0.81	0.49
CIS-Physical Activity Level				–	0.69	0.32
CIS-Total					–	0.61

SEF, CIS-Subjective Experience of Fatigue; ROC, CIS-Reduction of Concentration; ROM, CIS-Reduction of Motivation; PAL, CIS-Physical Activity Level; TOT, CIS-Total; EE, MBI-NL-Emotional Exhaustion. All correlations are significant at $P \leq 0.001$.

Table 3
Correlations among the personality and temperament scales

	E	A	C	ES	Aut	SE	SI	MO
Extraversion (E)	–	–0.07	0.06	0.52	0.54	0.38	–0.03	0.52
Agreeableness (A)		–	0.31	0.05	–0.18	0.09	0.37	–0.08
Conscientiousness (C)			–	0.20	0.10	–0.02	0.21	–0.08
Emotional Stability (ES)				–	0.62	0.52	0.28	0.49
Autonomy (Aut)					–	0.51	0.06	0.53
Strength of Excitation (SE)						–	0.21	0.65
Strength of Inhibition (SI)							–	0.13
Mobility (MO)								–

Correlations exceeding 0.09 are significant at the 0.01 level (two-tailed).

Table 4

Correlations between personality and temperament scores and fatigue scales

	SEF	ROC	ROM	PAL	TOT	EE
Extraversion (E)	−0.30	−0.31	−0.44	−0.28	−0.39	−0.34
Agreeableness (A)	−0.01	0.02	0.04	−0.04	0.01	−0.04
Conscientiousness (C)	−0.10	−0.26	−0.09	−0.24	−0.19	−0.13
Emotional Stability (ES)	−0.50	−0.47	−0.50	−0.38	−0.57	−0.45
Autonomy (Aut)	−0.22	−0.35	−0.38	−0.29	−0.35	−0.26
Strength of Excitation (SE)	−0.28	−0.35	−0.36	−0.22	−0.37	−0.35
Strength of Inhibition (SI)	−0.14	−0.16	−0.09	−0.06	−0.15	−0.11
Mobility (MO)	−0.28	−0.32	−0.36	−0.21	−0.36	−0.33

Correlations exceeding 0.09 are significant at the 0.01 level (two-tailed). SEF, CIS-Subjective Experience of Fatigue; ROC, CIS-Reduction of Concentration; ROM, CIS-Reduction of Motivation; PAL, CIS-Physical Activity Level; TOT, CIS-Total; EE, MBI-NL-Emotional Exhaustion.

temperament and fatigue ranged from −0.09 (Reduction of Motivation with Strength of Inhibition) to −0.37 (CIS-Total with Strength of Excitation). From the FFM dimensions, Agreeableness was unrelated to fatigue. The other correlations ranged from −0.09 (Conscientiousness with Reduction of Motivation) to −0.57 (Emotional Stability with CIS-Total).

Subsequently, six multiple regression analyses (MRA) were conducted to allow an examination of the variance in fatigue accounted for by personality and temperament. Each MRA was run with another fatigue (sub)scale as dependent variable (Table 5). Demographic variables (gender, age, educational level, marital status) were entered as a block on Step 1. Personality and temperament were entered as a block on Step 2. Personality dimensions appeared to explain significant proportions of the variance in fatigue. From the FFM personality dimensions, Extraversion and Emotional Stability played a role in the prediction of all fatigue (sub)scale scores; both dimensions inversely related to fatigue. In each instance, Emotional Stability (as a negative predication) accounted for the majority of the variance (between 17.4 and 31.5%). Conscientiousness was found to be a negative predictor of fatigue in four MRAs. Autonomy was a statistically significant predictor (with a positive standardized regression coefficient) in the case of the prediction of subjective experience of fatigue (CIS-20) and the total score on the CIS-20. Strength of Inhibition and Mobility, two of the three temperament scales, did not play a role in the prediction of fatigue. In contrast, low scores on Strength of Excitation predicted high scores on all fatigue (sub)scales.

4. Discussion

All traits from the FFM dimensions, with the exception of Agreeableness, were consistently and negatively related to fatigue. Extraversion, Autonomy, and especially Emotional Stability were firmly related to fatigue reports. Somewhat less substantial associations were found with Conscientiousness. Also with regard to temperament, all variables were negatively linked to fatigue. The strongest relationships were found in the case of Strength of Excitation and, to a lesser extent, Mobility. With respect to Strength of Inhibition the correlations were rather modest.

Table 5

Summary of stepwise multiple regression analyses of fatigue on personality and temperament

Dependent variable	Independent variable	Beta	R ² change	R ² Total
CIS-SEF	Gender	−0.029	0.007	0.007
	Emotional Stability	−0.510	0.244	0.251
	Autonomy	0.214	0.008	0.259
	Extraversion	−0.147	0.016	0.275
	Strength of Excitation	−0.112	0.008	0.283
Model: $F(5,593) = 46.85$, $P < 0.001$				
CIS-ROC	Emotional Stability	−0.226	0.198	0.198
	Conscientiousness	−0.211	0.032	0.230
	Strength of Excitation	−0.175	0.026	0.256
	Extraversion	−0.086	0.005	0.261
Model: $F(4,599) = 52.94$, $P < 0.001$				
CIS-ROM	Marital status	−0.011	0.010	0.010
	Emotional Stability	−0.286	0.223	0.233
	Extraversion	−0.252	0.056	0.289
	Strength of Excitation	−0.137	0.014	0.303
Model: $F(4,599) = 65.09$, $P < 0.001$				
CIS-PAL	Gender	−0.187	0.011	0.011
	Marital Status	−0.020	0.009	0.020
	Emotional Stability	−0.299	0.174	0.194
	Conscientiousness	−0.186	0.027	0.221
	Extraversion	−0.096	0.009	0.230
	Strength of Excitation	−0.086	0.005	0.235
Model: $F(6,598) = 30.62$, $P < 0.001$				
CIS-Total	Emotional Stability	−0.431	0.315	0.316
	Extraversion	−0.181	0.021	0.337
	Conscientiousness	−0.113	0.008	0.345
	Strength of Excitation	−0.151	0.012	0.357
	Autonomy	0.101	0.005	0.362
Model: $F(5,589) = 66.75$, $P < 0.001$				
MBI-NL-EE	Emotional Stability	−0.277	0.200	0.200
	Strength of Excitation	−0.166	0.020	0.220
	Extraversion	−0.126	0.012	0.232
	Conscientiousness	−0.103	0.010	0.242
Model: $F(4,599) = 47.74$, $P < 0.001$				

CIS-SEF, CIS-Subjective Experience of Fatigue; CIS-ROC, CIS-Reduction of Concentration; CIS-ROM, CIS-Reduction of Motivation; CIS-PAL, CIS-Physical Activity Level; UBOS-EE, MBI-NL-Emotional Exhaustion.

In general, the results concerning Emotional Stability (the opposite of neuroticism) and Extraversion are in accordance with existing research outcomes (De Vries & Van Heck, 2000, submitted for publication). In line with our expectations and one prior study (Mills & Huebner, 1998), Conscientiousness was also negatively related to fatigue. Contrary to our expectations, Autonomy

appeared to have a positive weight in MRAs with Subjective Experience of Fatigue and General Fatigue (CIS total score) as dependent variables. This finding contrasts with the rather sizeable negative correlations of the fifth factor of the Big Five with these fatigue scores, which are comparable with the negative links between Extraversion and Emotional Stability with these particular fatigue indices. It seems that Autonomy, compared with other Big Five predictors, in part taps the same aspect of fatigue, but in addition has a different content that taps a different aspect of the target constructs. Secondary MRAs (data not shown here) with only two independent variables, that is, Autonomy with only one competing predictor (Extraversion or Emotional Stability) revealed that the unexpected positive weight of Autonomy is due to the combination with Emotional Stability. As far as Autonomy reflects a strong common factor with Emotional Stability ($r=0.62$; Table 3), it does not provide incremental validity to the prediction of fatigue. However, unique variance, not shared with Emotional Stability, appears to be linked to fatigue in an opposite way. Here, future studies are needed to clarify this intriguing issue.

It was expected that Strength of Excitation was a negative predictor of fatigue. This was affirmed in this study. This study also revealed that, although Strength of Excitation is related to Emotional Stability (Strelau, 1983), it has an additional value in predicting fatigue scores. This is regardless of the type of fatigue. Contrary to expectations, Strength of Inhibition and Mobility did not play a role in predicting fatigue.

Concerning demographic characteristics, singles reported more fatigue. In addition, gender differences were only found with regard to subjective experience of fatigue and physical activity level; women had higher scores on the former, while men had higher scores on the latter variable. As far as marital status is concerned, it is generally assumed that married people evaluate their private life situation as more satisfactory than single individuals (Waldron, Weiss, & Hughes, 1998). They usually have more social support and they are likely to experience the rewarding aspects of family life, which may be helpful in overcoming fatigue. With regard to gender, it is well known that fatigue is more prevalent in women than in men (e.g. Bensing et al., 1996; Chen, 1986; De Vries, Van Heck, & Drent, 1999; Fuhrer, 1994; Kroenke, Wood, Mangelsdorff, Meier, & Powell, 1988; Martikainen et al., 1992). However, relatively little is known about gender differences concerning severity, frequency and type of fatigue. Loge et al. (1998) have reported gender differences in general fatigue scores and the component physical fatigue. In this study, women and men only differed with regard to two out of the six (sub)scales for assessing fatigue. This is in line with Lewis and Wessely (1992) who demonstrated that the more homogeneous the study population, the fewer gender differences in fatigue will appear.

In this study, about 18% of the respondents appeared to be very fatigued. This is in agreement with existing literature where percentages range between 14 and 25 (e.g. CBS, 1999; Chen, 1986; Loge et al., 1998). However, it is lower than the CBS found in a sample of Dutch employees. The percentage in the present study is based on cut-off scores that indicate problematic fatigue, whereas in the CBS sample a more lenient cut-off score was used.

A drawback of the present study is that it is cross-sectional and thus only provides preliminary results that can not be generalized. In future research, the predictive power of the basic personality dimensions with regard to fatigue should be examined in longitudinal studies.

In this study, the dimensions of Extraversion, Emotional Stability and Autonomy were found to be highly intercorrelated. The same applies to a certain extent for the Agreeableness and Conscientiousness dimensions. In the original paper on the construction and psychometric evaluation

of the FFPI (Hendriks et al., 1999) comparable correlations of 0.5 were observed among the scales Extraversion, Emotional Stability, and Autonomy. According to Hendriks and co-workers, this was the logical consequence of shared secondary loadings of the items. Stated otherwise, this ‘violation’ of the simple structure was the determined result of the construction process of the FFPI. Here, it should be kept in mind that the FFPI was based on a refinement of the classical Big Five simple-structure representation of personality traits into the Abridged Big-Five Dimensional Circumplex (AB5C; Hofstee, De Raad, & Goldberg, 1992). The latter taxonomic model of traits takes into account that most traits have at least two sizeable factor loadings. The model represents traits by projections in 10 circumplex planes using their two highest factor loadings. For instance, dominant and forceful are trait descriptive terms with a primary, positive loading on Extraversion and a secondary, negative loading on Conscientiousness. Compared with a simple-structure approach, that by definition strives at factor-pure facets, this deliberate attempt at writing items that reflect blends of two factors brings in more nuances in trait meaning. Obviously at the price of a lesser degree of independence of the factors. The sizeable association between Agreeableness and Conscientiousness is probably also caused by the purposeful effort of the FFPI constructors to avoid simple structure. This relationship between the Scales Agreeableness and Conscientiousness is also in line with Eysenck’s (1992a, 1992b) belief that these two dimensions essentially are reflecting one basic personality factor: Psychoticism.

In summary, this study has shown that personality and temperament dimensions, especially Emotional Stability, Extraversion, and Strength of Excitation, account for significant proportions of variance in fatigue. This contributes to the understanding of individual differences in the perception and reporting of physical symptoms. Longitudinal studies, however, are essential for examining the predictive value of these dimensions over time.

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References

- Bates, D. W., Schmitt, W., Buchwald, D., Ware, N. C., Lee, J., Thoyer, E., Kornish, R. J., & Komaroff, A. L. (1993). Prevalence of fatigue and chronic fatigue syndrome in a primary care practice. *Archives of Internal Medicine*, 153, 2759–2765.
- Bensing, J., Hulsman, R., & Schreurs, K. (1996). Vermoeidheid: Een chronisch probleem [Fatigue: A chronic problem]. *Medisch Contact*, 51, 123–124.
- Beurskens, A. J. H. M., Bültmann, U., Kant, I., Vercoulen, J. H. M. M., Bleijenberg, G., & Swaen, G. M. H. (2000). Fatigue among working people: validity of a questionnaire measure. *Occupational and Environmental Medicine*, 57, 353–357.
- Bohle, P., & Tilley, A. J. (1993). Predicting mood change on night shift. *Ergonomics*, 36, 125–133.
- Bültmann, U., De Vries, M., Beurskens, A. J. H. M., Bleijenberg, G., Vercoulen, J. H. M. M., & Kant, I. (2000). Measurement of prolonged fatigue in the working population: determination of a cutoff point for the Checklist Individual Strength. *Journal of Occupational Health Psychology*, 5, 411–416.

- Byrne, D. G. (1991). Occupational stress, Type A behaviour and risk factors for coronary disease. *Psychiatria Fennica*, 22, 53–62.
- CBS. (1999). *De leefsituatie van de Nederlandse Bevolking 1997. Deel 1: Gezondheid en Arbeid [Life circumstances of the Dutch population 1997. Volume 1: Health and work]*. Voorburg/Heerlen, The Netherlands: Centraal Bureau voor de Statistiek.
- Chen, M. K. (1986). The epidemiology of self-perceived fatigue among adults. *Preventive Medicine*, 15, 74–81.
- Costa, P. T. Jr., & McCrae, R. R. (1989). *NEO PI/FFI manual supplement*. Odessa, FL: Psychological Assessment Resources.
- Costa, P. T. Jr., & McCrae, R. R. (1992). *NEO Pi-R: Professional manual*. Odessa, FL: Psychological Assessment Resources.
- Deary, I. J., Agius, R. M., & Sadler, A. (1996). Personality and stress in consultant psychiatrists. *International Journal of Social Psychiatry*, 42, 112–123.
- De Vries, J., & Van Heck, G. L. (2000). Persoonlijkheid en emotionele uitputting. Een overzicht van de literatuur [Personality and emotional exhaustion. A review of the literature]. *Gedrag & Gezondheid*, 28, 90–105.
- De Vries, J., & Van Heck, G.L. (Submitted for publication). Fatigue and work: the mediating and moderating role of personality.
- De Vries, J., Van Heck, G. L., & Drent, M. (1999). Gender differences in sarcoidosis: Symptoms, quality of life, and medical consumption. *Women & Health*, 30, 99–114.
- Digman, J. M. (1990). Personality structure: emergence of the five-factor model. *Annual Review of Psychology*, 41, 417–440.
- Eysenck, H. J. (1966). *Conditioning, introversion-extraversion and the strength of the nervous system*. Paper presented at the meeting of the 17th Congress of Psychology, Moscow.
- Eysenck, H. J. (1992a). Four ways five factors are not basic. *Personality and Individual Differences*, 13, 667–673.
- Eysenck, H. J. (1992b). A reply to Costa and McCrae: P or A and C—the role of theory. *Personality and Individual Differences*, 13, 867–868.
- Frone, M. R., & Russell, M. (1995). Job stressors, job involvement and employee health: a test of identity theory. *Journal of Occupational and Organizational Psychology*, 68, 1–11.
- Froom, P., Melamed, S., Kristal-Boneh, E., Gofer, D., & Ribak, J. (1996). Industrial accidents are related to relative body weight: the Israeli CORDIS study. *Occupational and Environmental Medicine*, 53, 832–835.
- Fuhrer, R. (1994). Épidémiologie de la fatigue en médecine générale [Epidemiology of fatigue in primary care]. *L'Encéphale*, 20, 603–609.
- Gray, J. A. (1964). Strength of the nervous system and levels of arousal: a reinterpretation. In J. A. Gray (Ed.), *Pavlov's typology* (pp. 289–364). Oxford: Pergamon Press.
- Härmä, M., Ilmarinen, J., & Knauth, P. (1988). Physical fitness and other individual factors relating to the shiftwork tolerance of women. *Chronobiology International*, 5, 417–424.
- Hendriks, A. A. J. (1997). *The construction of the Five-Factor Personality Inventory (FFPI)*. Doctoral dissertation. Groningen, The Netherlands: University of Groningen.
- Hendriks, A. A. J., Hofstee, W. K. B., & De Raad, B. (1999). The Five-Factor Personality Inventory (FFPI). *Personality and Individual Differences*, 27, 307–325.
- Hoekstra, H. A., Ormel, J., & De Fruyt, F. (1996). *Handleiding bij de NEO Persoonlijkheids Vragenlijsten NEO-PI-R en NEO-FFI [Manual for the NEO Personality Inventories NEO-PI-R and NEO-FFI]*. Lisse, The Netherlands: Swets & Zeitlinger.
- Hofstee, W. K. B., De Raad, B., & Goldberg, L. R. (1992). Integration of the Big Five and circumplex approaches to trait structure. *Journal of Personality and Social Psychology*, 63, 146–163.
- Iskra-Golec, I., Marek, T., & Noworol, C. (1995). Interactive effect of individual factors on nurses' health and sleep. *Work & Stress*, 9, 256–261.
- John, O. P., Goldberg, L. R., & Angleitner, A. (1984). Better than the alphabet: taxonomies of personality-descriptive terms in English, Dutch and German. In H. Bonarius, G. L. Van Heck, & N. Smid (Eds.), *Personality psychology in Europe: theoretical and empirical developments* (pp. 83–100). Berwyn, IL: Swets North America.
- Kroenke, K., Wood, D. R., Mangelsdorff, A. D., Meier, N. J., & Powell, J. B. (1988). Chronic fatigue in primary care: prevalence, patient characteristics, and outcome. *JAMA*, 260, 929–934.

- Lewis, G., & Wessely, S. (1992). The epidemiology of fatigue: more questions than answers. *Journal of Epidemiology and Community Health*, 46, 92–97.
- Loge, J. H., Ekeberg, Ø., & Kaasa, S. (1998). Fatigue in the general Norwegian population: Normative data and associations. *Journal of Psychosomatic Research*, 45, 53–65.
- Magnusson, A. E., Nias, D. K. B., & White, P. D. (1996). Is perfectionism associated with fatigue?. *Journal of Psychosomatic Research*, 41, 377–383.
- Mann, A. H., McDonald, E., Cope, H., Pelosi, A., & David, A. (1994). Étude épidémiologique de la fatigue chronique en milieu de soins primaires (médecine générale) [An epidemiological study of chronic fatigue in primary care]. *L'Encéphale*, 20, 575–579.
- Martikainen, K., Urponen, H., Partinen, M., Hasan, J., & Vuori, I. (1992). Daytime sleepiness: A risk factor in community life. *Acta Neurologica Scandinavica*, 86, 337–341.
- Maslach, C., Jackson, S. E., & Leiter, M. P. (1996). *Maslach Burnout Inventory Manual* (3rd ed.). Palo Alto, CA: Consulting Psychologists Press.
- May, J., & Kline, P. (1988). Problems in using an adjective checklist to measure fatigue. *Personality and Individual Differences*, 9, 831–832.
- McCrae, R. R., & Costa, P. T. Jr. (1999). A five-factor theory of personality. In L. A. Pervin, & O. P. John (Eds.), *Handbook of personality: theory and research* (2nd ed.) (pp. 139–153). New York, NY: The Guilford Press.
- McCrae, R. R., & John, O. P. (1992). An introduction to the five-factor model and its applications. *Journal of Personality*, 60, 175–215.
- Mills, L. B., & Huebner, E. S. (1998). A prospective study of personality characteristics, occupational stressors, and burnout among school psychology practitioners. *Journal of School Psychology*, 36, 103–120.
- Pavlov, I. P. (1951–1952). *Complete works*, (2nd ed.). Moscow: SSSR Academy of Sciences. (In Russian).
- Piedmont, R. L. (1993). A longitudinal analysis of burnout in the health care setting: the role of personal dispositions. *Journal of Personality Assessment*, 61, 457–473.
- Rudow, B., & Buhr, J. (1986). Beziehungen zwischen Tätigkeitsmerkmalen, personalen Eigenschaften und dem Belastungserleben sowie neurotisch-functionellen Störungen bei Lehrern [Relationships between psychological activity, traits, perceived stress, and neurotic functional disorders in teachers]. In H. Schröder, & K. Reschke (Eds.), *Beiträge zur Theorie und Praxis der medizinischen Psychologie [Contributions to theory and practice of medical psychology]*, (Vol. 3) (pp. 43–54). Leipzig: Universität Leipzig.
- Rycken, J. (1997). *Werkdruk & welzijn: maatschappelijke, organisatorische en persoonlijke oorzaken van werkdruk in de sector zorg en welzijn [Work pressure & well-being: societal, organisational, and personal causes of work pressure in health care and well-being]*. Utrecht, The Netherlands: SWP.
- Saris, W. E. (1988). *Variation in response behaviour—a source of measurement error in survey research*. Amsterdam, The Netherlands: Sociometric Research Foundation.
- Schaufeli, W. B., & Van Dierendonck, D. (2000). *UBOS: Utrechtse Burnout Schaal—Handleiding [UBOS: Utrecht Burnout Scale—Manual]*. Lisse, The Netherlands: Swets & Zeitlinger.
- Strelau, J. (1983). *Temperament, personality, and activity*. London, UK: Academic Press.
- Strelau, J. (1987). The concept of temperament in personality research. *European Journal of Personality*, 1, 107–117.
- Strelau, J. (2001). The concept and status of trait in research on personality. *European Journal of Personality*, 15, 311–325.
- Strelau, J., Angleitner, A., Bantelmann, J., & Ruch, W. (1990). The Strelau Temperament Inventory- Revised (STI-R): Theoretical considerations and scale development. *European Journal of Personality*, 4, 209–235.
- Strelau, J., Angleitner, A., & Newberry, B. H. (1999). *Pavlovian Temperament Survey (PTS). An international handbook*. Seattle, WA: Hogrefe & Huber Publishers.
- Van Heck, G. L., De Raad, B., & Vingerhoets, A. J. J. M. (1993a). De Pavlov-Temperament-Schaal (PTS) [The Pavlov Temperament Survey]. *Nederlands Tijdschrift voor de Psychologie*, 48, 141–142.
- Van Heck, G. L., De Raad, B., & Vingerhoets, A. J. J. M. (1993b). De Pavlov Temperament Schaal (PTS): Theoretische achtergrond en schaal-constructie [The Pavlov Temperament Survey (PTS): Theoretical background and scale construction]. *WORC Paper 93.05.009/5*. Tilburg, The Netherlands: Tilburg University.
- Vercoulen, J. H. M. M., Alberts, M., & Bleijenberg, G. (1999). De Checklist Individual Strength (CIS) [The Checklist Individual Strength (CIS)]. *Tijdschrift voor Gedragstherapie*, 32, 131–136.

- Vercoulen, J. H. M. M., Swanink, C. M. A., Fennis, J. F. M., Galema, J. M. D., Van der Meer, J. W. M., & Bleijenberg, G. (1994). Dimensional assessment of chronic fatigue syndrome. *Journal of Psychosomatic Research*, 38, 383–392.
- Waldron, I., Weiss, C. C., & Hughes, M. E. (1998). Interacting effects of multiple roles on women's health. *Journal of Health and Social Behavior*, 39, 216–236.
- Williams, P. G., & Wiebe, D. J. (2000). Individual differences in self-assessed health: gender, neuroticism and physical symptom reports. *Personality and Individual Differences*, 28, 823–835.