



In search of personality and temperament predictors of chronic fatigue: a prospective study

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Abstract

This prospective study examined the relationships between temperament and personality, on the one hand, and chronic fatigue, on the other hand. The temperament variables were the Five-Factor-Model dimensions Emotional stability and Extraversion as well as Pavlovian temperament traits. The personality variables were the Five-Factor-Model dimensions Agreeableness, Conscientiousness and Autonomy, plus hardiness and Type A behavior pattern. It was expected that these person characteristics were negatively linked to fatigue except for (1) Type A and (2) Conscientiousness and Autonomy, which were scrutinized in an exploratory way. Respondents ($N=351$), working at least 20 h per week, completed two surveys. The first survey contained the temperament and personality questionnaires and the fatigue scale, while the second one, 2 years later, included the fatigue scale. Results indicated that high scores on the Five-Factor-Model dimensions Emotional Stability and Extraversion, the Pavlovian temperament variable Strength of Inhibition, and the hardiness component Commitment predicted lower fatigue scores. However, when in the analysis fatigue measured 2 years earlier was controlled for, only Extraversion and Strength of Inhibition appeared to be good predictors. Even so, these two predictors did not explain a large proportion of the variance. When men and women were examined separately, personality and temperament predicted almost nihil. In conclusion, when fatigue measured earlier is controlled for, the direct role of temperament and personality decreases enormously.

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Chronic fatigue is a common phenomenon which can have a far-reaching influence on a person's life. Mental and physical exertion caused by, for instance, work or sport activities, induce acute fatigue. This form of fatigue is characterized by task specificity and short-term reversibility

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(Meijman & Schaufeli, 1996). In contrast, chronic fatigue cannot be reduced by switching to rest or another task (Meijman & Schaufeli, 1996). However, until now, there exists no general agreement on the determinants of chronic fatigue (Vercoulen et al., 1998). Vercoulen, Alberts, and Bleijenberg (1999) have pointed to the role of behavioral, cognitive, and affective factors in maintaining fatigue. Lewis and Wessely (1992) have mentioned the influence of personality. Unfortunately, there is a scarcity of studies focussing on the impact of temperament and personality on fatigue. Recently, De Vries and Van Heck (2000) have reviewed the literature on a specific form of fatigue: the burnout component emotional exhaustion. They found that affectivity, anxiety, and the Type A behavior pattern were positively, and hardiness and emotional stability negatively associated with emotional exhaustion. In a second review, focussing on a broader conceptualization of fatigue, De Vries and Van Heck (submitted for publication) added extraversion to this list of personality factors. Pointing at the limitations of cross-sectional studies, they recommended the use of a longitudinal design to examine the associations between temperament and personality, on the one hand, and fatigue, on the other hand.

The term ‘temperament’ refers to individual difference variables that often are considered as at least partly distinct from personality characteristics. When this distinction is made, temperament is mostly conceived of as denoting characteristics that (1) have a relatively strong and direct constitutional basis; (2) tend to appear early in life; (3) exert broad effects on behavior, and (4) concern the more formal characteristics of behavior, such as tempo and endurance, rather than the specific content of behavior (Angleitner & Riemann, 1991; Kagan & Snidman, 1991; Strelau, 1987; Strelau & Zawadzki, 1993; Thomas & Chess, 1985). One of the most influential temperament models has been constructed by Pavlov (1951–1952), and has been developed further by Strelau and co-workers (e.g. Strelau, Angleitner, & Newberry, 1999). The model is based on Pavlov’s observations of individual differences in responses to conditioning situations and the nervous system traits he postulated to account for them (Strelau, 1983). Strelau et al. (1999) have described the nervous system and its properties extensively. Here, only a short description is given. Strength of excitation (SE) refers to the nervous system’s capacity to work, particularly under prolonged or intense stimulation. It is connected with a high threshold for protective inhibition. Strength of inhibition (SI) is the system’s ability to develop and maintain conditioned inhibition as seen in such phenomena as extinction, delay, and stimulus discrimination. Mobility of nervous processes (MO) refers to the ability to respond adequately to changes in stimulus conditions, including environmental demands. To our knowledge, only two studies examined the direct relationship between the Pavlov temperament variables and fatigue (De Vries & Van Heck, 2002; Rudow & Buhr, 1986). In the study by Rudow and Buhr (1986), the only Pavlovian temperament variable that correlated highly and negatively with emotional exhaustion was SE. In line with this finding, also De Vries and Van Heck (2002) found that low scores on SE predicted high fatigue scores.

Besides temperament, also personality is conceived of as an important factor in the development of chronic fatigue. Two personality ‘systems’, both well known for their associations with health-related measures, are the Big Five model and the multifaceted hardiness construct. Nowadays, there is general agreement about the view that personality, at least for descriptions at a rather global level, can be described adequately in terms of the Big Five dimensions: extraversion, agreeableness, conscientiousness, emotional stability, and openness to experience (see, e.g. Digman, 1990; Goldberg, 1990). 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. Emotional stability stands for the tendency to experience no distressing emotions such as fear, guilt, and frustration. Finally, the fifth factor points at a receptive orientation towards varied experiences and ideas (see, Costa & McCrae, 1989, for a more detailed description of these five basic factors). Hofstee, De Raad, and Goldberg (1992) have refined this representation of personality into the Abridged Big-Five Dimensional Circumplex (AB5C) model, which integrates simple structure and circumplex representations. Due to this less global structure, the AB5C-model is able to represent more nuances in trait meaning.

Whether the Big Five should be regarded as temperament or as personality factors is still an unresolved issue. Hofstee (1991) has suggested that Extraversion and Emotional stability have strong temperament connotations. Referring to empirical evidence for the involvement of neurobiochemical mechanisms, early childhood manifestations, and the occurrence in men and animals, Strelau (1998) has stated that these two dimensions, in contrast to the other three Five-Factor-Model dimensions, clearly belong to the domain of temperament.

Two recent reviews on relationships between personality and work-related fatigue (De Vries & Van Heck, 2000, submitted for publication) have suggested that individuals with high scores on scales for assessing emotional stability and extraversion report less fatigue than neurotics and introverts. For instance, Koller, Haider, and Recher (1984) as well as May and Kline (1988) and Montgomery (1983) found that extraverts reported less fatigue and emotionally unstable individuals more fatigue. It should be mentioned that in contrast to extraverts, who have the tendency to deny experiences of fatigue, there are some indications that emotionally unstable individuals experience more fatigue (May & Kline, 1988). Inconsistent results have been found with respect to the relationship between fatigue, i.e., the burnout component emotional exhaustion, and conscientiousness (Deary, Agius, & Sadler, 1996; Mills & Huebner, 1998). Furthermore, in two studies (Mills & Huebner, 1998; Piedmont, 1993), a negative relationship was found between agreeableness and emotional exhaustion. Finally, the fifth factor and emotion exhaustion seem to be unrelated (Deary et al., 1996; Piedmont, 1993).

Hardiness, introduced by Kobasa (1979), is characterized by *commitment* to oneself and work, a sense of personal *control* over one's experiences and outcomes, and the perception that change represents *challenge*, and thus should be treated as an opportunity for growth (Kobasa, 1979). Hardy individuals have resistance to illness resulting from (1) perceiving life changes as less stressful (Kobasa, 1979) or (2) having more resources at their disposal to cope with life changes (Kobasa, Maddi, & Kahn, 1982). In line with this, a direct relationship was found between hardiness, measured globally, and psychological distress (Nowack, 1985; Rhodewalt & Agustodottir, 1984). When the components of hardiness were analyzed separately, commitment (Holt, Fine, & Tollefson, 1987; Papadatou, Anagnostopoulos, & Monos, 1994; Van Servellen, Topf, & Leake, 1994), control (Lee & Ashforth, 1990; Papadatou et al., 1994; Van Servellen et al., 1994), and challenge (Papadatou et al., 1994; Van Servellen et al., 1994) were negatively related to emotional exhaustion. In most studies, it has been found that components of hardiness are significantly related to emotional exhaustion. It should be noted, however, that only commitment is invariably related to this burnout component.

The Type A behavior pattern (TABP) is characterized by competitive drive, time urgency, and hostility (Friedman & Rosenman, 1974; Kawachi, Sparrow, Kubzansky, Illspiros, Vokonas, &

Weiss, 1998). Type A persons are claimed to run a higher risk of premature cardiovascular disease (Rosenman, 1993; Wright, 1988). The nature of the relationship between TABP and fatigue is still unclear; partly due to the use of different questionnaires to measure Type A. Because of this reason, negative (Weidner & Matthews, 1978) as well as positive (Nowack, 1991; Stern, Harris, & Elverum, 1981) relationships between TABP and chronic fatigue have been found. In addition, Offutt and Lacroix (1988) demonstrated an absence of TypeA/B differences in fatigue. However, in general emotional exhaustion and Type A appeared to be related (De Vries & Van Heck, 2000).

In the present study, scales for Extraversion, Emotional stability, and the Pavlovian temperament variables were used as temperament indicators, and the remaining Big Five scales as personality indicators. Instruments to measure hardiness and the Type A behavior pattern were employed as well. It was hypothesized that Strength of Excitation, Strength of Inhibition, Mobility of Nervous Processes, Emotional Stability, Extraversion, Agreeableness, and the hardiness total score, as well as the three components Challenge, Commitment, and Control, would predict low scores on fatigue, two years later. Type A and the Big Five factors Conscientiousness and Autonomy were included as exploratively investigated variables. Gender differences in predictors of fatigue were also examined.

1. Method

1.1. Participants and procedure

Participants randomly received a telephone call, worked at least 20 h per week, and agreed to complete a number of questionnaires as part of a 2-year longitudinal study with five measurement points. The results presented here concern the first and the last measurement points. Three hundred and twenty-five (42%) out of a group of 765 individuals (first time point) returned a completed test booklet at both measurement points; 173 men ($M=45$ years, $S.D.=8.4$) and 150 women ($M=43$ years, $S.D.=9.2$). Gender was unknown for two respondents. Concerning the representativeness of this sample, no differences were found with regard to personality, temperament, and fatigue between individuals who only participated at the first measurement point and persons who also were involved at the second measurement point. With regard to their fatigue score, it can be said that 30.4% of this sample is considered to be extremely tired.

1.2. Questionnaires

Respondents completed questionnaires for assessing temperament and personality (PTS, Strelau et al., 1999; FFPI, Hendriks, Hofstee, & De Raad, 1999; PVS, Maddi, 1997; JAS, Jenkins, Zyzanski, & Rosenman, 1979), as well as a fatigue scale (FAS) at both time points (Michielsen, De Vries, Van Heck, Van de Vijver, & Sijtsma, accepted for publication).

The Pavlovian-oriented temperament characteristics were measured with the Pavlov Temperament Survey (PTS; Strelau et al., 1999; Dutch version by Van Heck, De Raad, & Vingerhoets, 1993). This questionnaire contains 60 items designed to measure Strength of Excitation (SE), Strength of Inhibition (SI), and Mobility of Nervous Processes (MO). Each subscale is measured

by 20 items on a four-point Likert 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's alpha coefficients were 0.88, 0.78, and 0.91 for SE, SI, and MO, respectively (Van Heck et al., 1993).

The Five-Factor Personality Inventory (FFPI; Hendriks et al., 1999) was used to assess the Five-Factor Model (FFM) dimensions: extraversion, agreeableness, conscientiousness, emotional stability, and autonomy. The FFPI 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 are satisfactory (Hendriks et al., 1999). For instance, Hendriks (1997) has 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 (Hendriks, 1997) between the FFPI factors and the corresponding domain scales of other FFM personality inventories, such as the Revised NEO Personality Inventory (NEO-PI-R; Costa & McCrae, 1989, 1992).

To measure hardiness, the 50-item Hardiness scale (Personal Views Survey, (PVS; Maddi, 1997; Kobasa, 1985; Dutch version by Van Heck & De Vries, 1994), with positive as well as negative items, was obtained to yield a total score for hardiness and scores for the Challenge (17 items), Commitment (16 items), and Control (17 items) subscales. The rating scale ranged from 0, *not at all true*, to 3, *completely true*. Previous studies have demonstrated adequate internal consistency for the total score (Bernas & Major, 2000) and the three subscales (Williams, Wiebe, & Smith, 1992). Reliability coefficients in the present study ranged from 0.58 (Control) to 0.68 (Challenge) for the subscales and 0.80 for the total score. To raise the alpha's of the subscales, one item (no. 27) was removed from the Challenge subscale (0.72) and two items (nos. 1 and 38) from the Commitment scale (0.72). No reliability improvement could be observed by deletion of items of the Control subscale.

The 24-item version of the Jenkins Activity Scale (JAS; Jenkins et al., 1979; Dutch version by Appels, Mulder, & Van Houtem, 1995) yields a score for overall Type A. Scores at the positive end of the scale indicate Type A behavior. The rating scale is different for almost each question. Reliability and content validity are good (Appels et al., 1985; Jenkins et al., 1979).

The 10-item Fatigue Assessment Scale (FAS; Michielsen et al., *accepted for publication*) is a new, unidimensional fatigue scale, which was tested in a large ($n = 1835$) sample, representative for the Dutch population. The items have a rating scale, ranging from 1, *never*, to 5, *always*. Cronbach's alpha was good (0.87). Factor analysis revealed that the FAS measured one construct. Also Mokken Scale Analysis demonstrated that the FAS formed one reliable scale (Michielsen et al., *submitted for publication*). In the present study, to control for fatigue at measurement point 1, a set of items was used that contained 9 out of the 10 items of the current version of the FAS (Michielsen, De Vries, & Van Heck, *in press*). This set of items was called FAS1. FAS2 is the current version of the FAS, measured 2 years later than FAS1.

1.3. Statistical procedure

First, means, standard deviations, and Cronbach Alpha's were calculated for the temperament and personality scales and the fatigue scale. Second, gender and age differences (age categories 21–37, 38–44, 45–51, and 52–65 years) in temperament, personality, and fatigue scores were

examined by *t*-tests and (post-hoc Scheffé comparison) analyses of variance (ANOVA), respectively. Third, Pearson correlations were calculated (1) between the FAS1 and the FAS2, (2) among the temperament and personality variables, and (3) between fatigue, on the one hand, and the temperament and personality (sub)scales, on the other hand. Then, two stepwise regression analyses were performed with fatigue, measured at the last measurement point, as a dependent variable. In the first analysis, in block 1, gender and age were included. Block 2 consisted of the temperament and personality (sub)scales (with the exception of the Agreeableness and Conscientiousness Scales, due to non-significant correlations between these particular FFPI scales and the FAS2; see results). In the second regression analysis, block 1 included gender and age; block 2 contained the FAS1, and block 3 consisted of the temperament and personality (sub)scales. In addition to the analyses of the total sample, these two stepwise regression analyses were also done for men and women separately.

2. Results

Means, standard deviations, and reliability coefficients of the used scales are presented in Table 1. Women scored significantly higher on Agreeableness [$t(1, 299) = -3.53, P < 0.001$] and the hardiness subscale Commitment [$t(1, 293) = -3.83, P < 0.05$]. Men scored higher on Strength

Table 1
Means, standard deviations and reliability coefficients of the (sub)scales

(Sub)scale	<i>M</i>	SD	α
<i>Pavlov Temperament Scale</i>			
Strength of Excitation	49.1	6.8	0.84
Strength of Inhibition	52.2	5.4	0.74
Mobility	56.8	7.4	0.90
<i>Jenkins Activity Survey</i>	15.2	4.8	0.70
<i>Five Factor Personality Inventory</i>			
Extraversion	70.8	9.8	0.91
Agreeableness	76.5	6.7	0.80
Conscientiousness	74.0	8.3	0.87
Emotional Stability	77.4	8.8	0.91
Autonomy	72.1	7.5	0.86
<i>Personal Views Survey total score</i>			
Challenge	101.7	8.0	0.80
Commitment	46.3	5.8	0.72
Control	47.8	4.7	0.72
	51.0	4.7	0.58
<i>FAS1</i>	20.2	8.1	0.85
<i>Fatigue Assessment Scale (FAS2)</i>	19.1	6.4	0.90

of Excitation [$t(1, 302) = -2.55, P < 0.01$] and Emotional Stability [$t(1, 299) = 4.52, P < 0.001$]. No sex difference was found on the FAS2 score. Age differences were only found for the hardiness total score ($P < 0.01$) and the three hardiness subscales: the youngest group (18–37 years) scored higher on Challenge ($P < 0.05$), Commitment ($P < 0.01$) and Control ($P < 0.05$) than the oldest group (52–65 years).

The FAS1 and FAS2 correlated significantly ($r = 0.62, P < 0.001$). Correlations among the temperament and personality (sub)scales are shown in Table 2. Especially Strength of Excitation and Mobility correlated strongly and positively with Extraversion, Emotional Stability, Autonomy, as well as the hardiness component Challenge. In general, all temperament and personality dimensions were negatively related to fatigue (see Table 2). Only Type A had positive relations with fatigue. Agreeableness and Conscientiousness did not correlate significantly with fatigue. Therefore, they were not included in the following regression analyses.

According to the first stepwise regression analysis, three dimensions predicted fatigue: Emotional Stability ($\beta = -0.23$), Extraversion ($\beta = -0.26$), and Strength of Inhibition ($\beta = -0.17$). Together they explained 21% (adjusted R^2) of the variance of fatigue [$F(3, 217) = 19.89, P < 0.001$]. Emotional Stability by itself explained 16% of the variance. When the components of hardiness were examined in a separate analysis, Commitment ($\beta = -0.14$) was added as a predictor. Together the predictors explained 22% (adjusted R^2) of the variance of fatigue [$F(4, 217) = 16.69, P < 0.001$]. When the predictors of fatigue were examined separately for men and women, Autonomy ($\beta = -0.48$) and Type A ($\beta = 0.21$) explained 22% (adjusted R^2) of the variance of fatigue [$F(2, 118) = 17.23, P < 0.001$] for men, while for women only Emotional Stability ($\beta = -0.39$) was a significant predictor [adjusted $R^2 = 0.14; F(1, 101) = 17.87, P < 0.001$]. Including the hardiness components in the analyses instead of the total score did not lead to different results.

In the second series of stepwise regression analyses, controlling for fatigue at the first measurement point, three variables appeared to predict fatigue: fatigue measured two years earlier ($\beta = 0.56$), Extraversion ($\beta = -0.17$), and Strength of Inhibition ($\beta = -0.11$). Together they explained 43% (adjusted R^2) of the variance of fatigue [$F(3, 216) = 54.63, P < 0.001$]. However, fatigue alone already explained 40% of the variance. The analyses conducted separately for males and females revealed different patterns. For women, only fatigue measured 2 years earlier was a predictor of fatigue [$\beta = 0.60$; adjusted $R^2 = 0.35; F(1, 100) = 55.57, P < 0.001$]. For men, earlier fatigue ($\beta = 0.60$) and Autonomy ($\beta = -0.16$) were predictors, together explaining 45% (adjusted R^2) of the variance [$F(2, 115) = 50.43, P < 0.001$]. These patterns remained the same when the hardiness components instead of the hardiness total score were entered in the analyses.

3. Discussion

In summary, in this prospective study almost all temperament and personality variables correlated negatively with fatigue, while TABP had a positive correlation with fatigue. Emotional stability, extraversion, strength of inhibition, and commitment predicted fatigue. However, when controlling for fatigue experienced at the first measurement point, only earlier fatigue, extraversion, and strength of inhibition were predictors of fatigue measured 2 years later. When looking at men and women separately, the role of temperament and personality diminished even more.

Table 2
Correlations between the temperament, personality, Type A, and fatigue scales

Scales	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1. SE	–	0.14*	0.68***	0.01	0.32***	–0.12*	–0.03	0.46***	0.50***	0.27***	0.30***	0.11	0.23***	–0.37***	–0.31***
2. SI		–	0.06	–0.35***	–0.07	0.40***	0.20**	0.22***	0.03	0.12*	0.04	0.12*	0.14*	–0.17**	–0.21***
3. MO			–	0.06	0.47***	–0.06	–0.14*	0.42***	0.50***	0.31***	0.37***	0.12*	0.23***	–0.32***	–0.23***
4. JAS				–	–0.01	–0.34***	–0.05	–0.22***	0.13*	0.01	0.02	–0.03	0.03	0.12*	0.15*
5. F1					–	–0.08	–0.01	0.48***	0.52***	0.28***	0.24***	0.21***	0.29***	–0.33***	–0.34***
6. F2						–	0.32***	0.07	–0.10	–0.10	–0.16**	–0.04	0.03	0.02	–0.03
7. F3							–	0.11	0.10	–0.12*	–0.37***	0.01	0.08	–0.14*	–0.11
8. F4								–	0.60***	0.35***	0.28***	0.18**	0.38**	–0.53***	–0.38***
9. F5									–	0.37***	0.30***	0.20**	0.38**	–0.34***	–0.28***
10. Har										–	0.81***	0.82***	0.77***	–0.26***	–0.27***
11. Chal												–	0.50***	0.39**	–0.21***
12. Com													–	0.54***	–0.23***
13. Contr														–	–0.24***
14. FAS1															–
15. FAS2															

SE=Strength of Excitation; SI=Strength of Inhibition; MO=Mobility of Nervous Processes; JAS=Jenkins Activity Survey; F1=Extraversion; F2=Agreeableness; F3=Conscientiousness; F4=Emotional Stability; F5=Autonomy; Chal=Challenge; Com=Commitment; Contr=Control; FAS=Fatigue Assessment Scale.

* $P < 0.05$.

** $P < 0.01$.

*** $P < 0.001$.

As expected, the three temperament aspects strength of excitation, strength of inhibition, and mobility of nervous processes had a negative correlation with fatigue. This is in line with findings by De Vries and Van Heck (2002) and Rudow and Buhr (1986). However, while the latter authors found that strength of excitation was one of the predictors of emotional exhaustion, a work-related kind of fatigue, in the present study, strength of inhibition was the only significant temperament predictor of fatigue. It should be noted that the studies by De Vries and Van Heck (submitted for publication) and Rudow and Buhr (1986) both had a cross-sectional design, in contrast to the present prospective study. More prospective research in this area, however, is needed to examine whether the present findings can be reproduced. When fatigue measured 2 years earlier was controlled for, emotional stability failed to predict fatigue. The correlation between emotional stability and fatigue measured at the first measurement point was higher than the correlation between emotional stability and fatigue measured 2 years later. Apparently, emotional stability and fatigue have much common variance. On the other hand, the correlations between emotional stability and fatigue also make clear that the constructs, though related, are not identical.

Although Type A correlated positively with fatigue, it was no substantial predictor of fatigue in the first analysis. The positive correlation, however, is in accordance with the general conclusion in the review by De Vries and Van Heck (submitted for publication). However, the outcomes of the studies which were reviewed were rather inconsistent (see, e.g. Nowack, 1991; Offutt & Lacroix, 1988; Weidner & Matthews, 1978). Therefore, Type A was tested exploratively. Other characteristics, such as extraversion and emotional stability, were related more strongly to fatigue. The influence of Type A on fatigue could be masked by the high correlation between Type A and emotional stability. If, in future studies, this relationship between Type A and emotional stability is invariably found, one should consider measuring only emotional stability.

In the first analysis, emotional stability and extraversion were important predictors of fatigue. Also autonomy was significantly associated with fatigue. Contrary to the expectations, agreeableness was not related to fatigue. The studies (Mills & Huebner, 1998; Piedmont, 1993) on which our hypothesis was based focussed on emotional exhaustion, a work-specific kind of fatigue. In contrast, the present study examined general fatigue. It is possible that this distinction caused the difference in outcomes. Furthermore, the hardiness total score and all three hardiness components correlated significantly with fatigue (see, e.g. Papadatou et al., 1994; Van Servellen et al., 1994), while only commitment predicted fatigue. It should be remembered that this particular hardiness component was the only construct that was consistently related to emotional exhaustion in all studies mentioned in the introduction (Holt et al., 1987; Papadatou et al., 1994; Van Servellen et al., 1994).

Interesting was the finding that women reported more commitment than men. Not many studies can be found with separate subscale scores on the Personal Views Survey for women and men. However, in a study among adolescents attending school (Shepperd & Kashani, 1991), women reported more commitment than men. In the present study, the gender difference on commitment scores might be explained by the fact that working women are a self-selected group with above average work commitment (Fiorentine, 1987, Hakim, 1991). Although society has changed tremendously in the last decade, working women might still be more committed to their work than men. In the Netherlands, still a large proportion of the female population do not have a paid job (Geurts, Kompier, & Gründemann, 2000). A study by Scandura and Lankau (1997) revealed that

women, who perceived their work environment as offering flexible work hours, reported higher levels of organizational commitment and job satisfaction than (1) men and (2) women who did not perceive this flexibility. In the Netherlands, women are increasingly entering the workforce (Geurts et al., 2000), from 36% in 1988 to 49% in 1998, mainly in part-time jobs. This is partly due to the deliberate policy pursued by the Government and social partners to promote part-time work (Netherlands: The part-time work phenomenon, 1998). It is likely that Dutch women, motivated by the possibility of flexible working hours, have increased commitment to their work and the organization they work for.

When the predictors of fatigue were examined separately for men and women, some interesting patterns emerged. For men, two constructs, namely Type A and autonomy, appeared to be predictors, while these two constructs were not identified as significant predictors in the analysis of the total sample. Studies have shown that men manifest the Type A behavior more than female adolescents (Keltikangas-Järvinen, & Raikonen, 1990, 1991; Sharpley, James, & Mavroudis, 1993), probably because the construct is based on male behavior (Friedman & Rosenman, 1974). However, when in the second regression analysis fatigue measured two years earlier was controlled for, Type A disappeared as a predictor for men, while autonomy remained significant. In a cross-cultural study, Williams, Satterwhite, and Best (1999) found that across 25 countries, men appeared to score higher on openness to new experiences. Trzcieniecka-Green and Steptoe (1994) found that openness was related to reduction in anxiety. Moreover, Sørli and Sexton (2001) reported that openness predicted active coping, stressing the mediating effect of this Big Five factor. In the already mentioned study by Williams et al. (1999), women were less emotionally stable than men. In the analyses with women, emotional stability predicted fatigue, when fatigue at the first measurement was not included. However, overall, in the second analysis the role of personality and temperament was not extremely important. Nevertheless, the present prospective study supports the idea that personality and temperament might be moderators in the stress-illness relationship (see, e.g., Kobasa, 1979; Strelau, 1995).

Interesting to note is that in the present sample no gender difference in the total FAS2 score was found, although it is widely thought that women report more fatigue than men (e.g. Bensing & Schreurs, 1995; Lewis & Wessely, 1992; Skapinakis, Lewis, & Meltzer, 2000). It is likely that the women in the present study are not representative for women in the general Dutch population, because the criterion to be included in the study was having a paid job for at least 20 h per week. Consequently, due to the healthy worker effect, in the present study women might be healthier than the average Dutch woman. Concerning age and fatigue, conflicting results have been obtained (see, Michielsen, De Vries, & Van Heck, in press). Some researchers have found an effect of age on fatigue (e.g. Van Mens-Verhulst & Bensing, 1998), while others have reported only a weak association or have failed to observe any relationship at all (e.g. Lewis & Wessely, 1992; Loge, Ekeberg, & Kaasa, 1998; Uttl, Graf, & Cosentino, 2000). In the present study, age did not play a sizeable role in predicting chronic fatigue. Again, this could be caused by the selection of respondents, who were all able to work. It would be interesting to examine whether our findings would hold in a population that also includes individuals who do not work because they retired or because they receive work disability benefit.

A methodological explanation of the, sometimes, surprising findings may be the prospective design of this study. Until now, most research has been cross-sectional. This type of research does not allow inferences about causality. In contrast, a prospective study like the present one overcomes

this disadvantage and yields results that can give a clearer view on the causal relations. Therefore, the results of this study are considered to be important for further theorizing about the role of temperament and personality with respect to fatigue. The percentage of fatigue variance explained by temperament and personality, however, is quite low. It is believed that these constructs influence the experience of fatigue, but not directly. Therefore, future research should focus on the moderating effects of personality and temperament.

In this study, extraversion, emotional stability, and autonomy were highly intercorrelated. The same applies to a certain degree for agreeableness and conscientiousness. 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. 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 et al., 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, optimistic, vital, and cheerful are trait descriptive terms with a primary, positive loading on Extraversion and a secondary, positive loading on emotional stability. 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, 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.

One shortcoming of the present study is that changed life circumstances were not measured. The fatigue score might be influenced by major life events such as pregnancy, a job switch, or the death of a spouse. In addition, although no differences between the samples of the two measurement points were found in, for instance, personality scores, there might be a selection bias. The group that agreed to complete the first questionnaire might be different from the group that refused to take part in this research altogether. Thirdly, subjects were part of a sample representative for the working population. It is unknown whether the data are generalizable to the general population.

The finding that fatigue measured at baseline was a good predictor of fatigue measured 2 years later indicates that the experience of fatigue is a rather stable feeling. This is in accordance with the longitudinal study by Janssen and Nijhuis (2001), who examined the stability of fatigue and emotional exhaustion, a work-related kind of fatigue. They found that these fatigue forms showed a large amount of stability over time. In a statistical analysis (data not shown), using standardized scores separated in 10 equal groups of the baseline and last fatigue measurement point, it was demonstrated that the fatigue scores of almost three quarters of the participants differed at maximum two groups. This should encourage professionals to screen individuals for fatigue in the general practitioner or work context. In this way, it is possible to detect groups of individuals who are at risk to develop a chronic form of fatigue. Furthermore, the stability of fatigue could be partly explained by personality and temperament. Consistent adverse life circumstances or a combination

of life circumstances and personal factors could also influence the stability of fatigue. Future research should pay attention to the determinants of the stability of fatigue.

In summary, all Pavlovian temperament variables, as well as almost all the other temperament and personality variables correlated negatively with fatigue. Emotional stability, extraversion, strength of inhibition, and commitment were significant predictors of fatigue. However, when controlling for fatigue measured two years earlier, the influence of the temperament and personality predictors almost disappeared, also when men and women were examined separately. In future research, it would be interesting to direct attention to the moderating effects of appraisal and coping in the temperament/personality relationship with fatigue, instead of focussing on the direct effects of temperament and personality on fatigue.

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