The Role of Negative Affectivity in Self-assessment of Health

A Structural Equation Approach

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Abstract

The relationship between negative affectivity (NA, i.e. the Neuroticism trait and transient distress), self-reported medical condition and somatic complaints was assessed in structural equation models also including personality (the Big Five personality domains), socio-demographic, and health behaviour variables. The results indicated that the individual’s current distress level and medical condition were by far the strongest predictors of somatic complaints. Compared to the other Big Five domains, Neuroticism was clearly the most important variable in all the models tested; it evidenced substantial direct effects on both distress level and medical condition, and a significant indirect effect on somatic complaints. On the whole, the effects of the sociodemographic and health behaviour variables were of only marginal importance as compared to NA.

Keywords

negative affectivity, somatic complaints, structural equation modelling

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Accumulated research has shown that negative affectivity (NA; Watson & Clark, 1984) is strongly and consistently correlated with health complaints scales, i.e. subjective health measures that reflect an individual’s perception and interpretation of physical and emotional symptoms and sensations (Costa & McCrae, 1985a, 1987; Watson & Pennebaker, 1989). The NA factor can be measured either as a trait (i.e. persistent differences in negative mood) or as a state (i.e. transient fluctuations in negative affect level or distress), and subsumes a broad range of aversive mood states including nervousness, tension, worry, anger, disgust, guilt and depression. The NA trait is measured by a large number of commonly used scales (Watson & Clark, 1984) and has variously been termed Neuroticism, general distress or maladjustment (in the present context the terms Neuroticism and trait NA are used interchangeably, as are state NA and current or transient distress). All else being equal, individuals high in NA are likely to be critical of themselves and others, and they tend to emphasize the negative aspects of their experiential world, their health condition included.

As has been discussed in the literature, these reporting differences can produce correlations among self-report measures that have little or no objective basis. For example, Watson and Pennebaker (1989) found that NA was consistently correlated (in the 0.30–0.50 range) with a number of widely used symptom scales, but that it was unrelated or only weakly related to a variety of more objective health indicators, such as cholesterol level, health care visits, hospitalization or health-related absences from work or school.

Moreover, several self-report variables commonly used as predictors of health status, including social support and coping (Clark & Watson, 1991), have also been shown to be significantly associated with NA. Again, such results can be interpreted to indicate that the observed correlations among the variables in question are, to a large extent, the spurious product of reporting differences associated with NA. A further possible implication of this research is that both biomedical and sociodemographic variables, as compared with NA, contribute only marginally, if at all, to the variance in self-reported symptoms.

However, as pointed out by Smith, Wallston, and Dwyer (1995), it is important to evaluate carefully the extent of NA’s impact on subjective measures in order to take it into account without overreaction. Moreover, extensive research has revealed that both NA and subjective health measures are embedded in a network of associations with other variables, including sociodemographic, medical and health behaviour variables (Vassend, 1994). Viewed against this background, the relationship between NA and self-reported symptoms is profoundly complex and requires a detailed consideration of the evidence.

It is noteworthy that in the original as well as in more recent research on NA and self-reported health, research findings are usually expressed as simple (zero-order) correlations (e.g. Watson & Pennebaker, 1989) or partial correlations (Smith et al., 1995). An exception to this is a study by Deary, Clyde, and Frier (1997) in which theories of symptom reporting were tested using structural equation modelling. However, their study was based on a selected patient sample, and several conceptually interesting variables (both health behaviour and sociodemographic variables) were not included. Thus, there is a lack of population based studies in which the relationship between NA and self-reported health (and other relevant medical, social and psychological variables) is analysed in explicit and comprehensive statistical models. Such investigations are crucial for correctly assessing the strength and consistency of NA effects on subjective health indicators when relevant extraneous variables are controlled for (as in ordinary regression analysis), as well as for a more refined interpretation of structural relationships between variables in the model (as in, for example, structural equation modelling).

This challenge formed the point of departure for the present investigation. Below, a brief review of NA research as applied to health-related topics is given. A comprehensive review of the vast literature possibly relevant to this research field (e.g. studies of the psychophysiology of anxiety, or sociological research on self-assessed health) is beyond the scope of the present article. However, a selection of studies focusing on the role of health behaviour, medical and sociodemographic variables in self-assessment of health are included, as these studies are judged to be relevant for the interpretation of the NA–somatic complaints relationship and the...
development of a comprehensive model. A schematic model of plausible relationships between these domains of variables is depicted in Figure 1. For the sake of clarity of presentation, the variables on the left-hand side and in the middle of the figure are denoted independent and intervening variables, respectively. Somatic symptom reporting is the dependent variable in the model. The paths from the independent variables in the schematic model correspond to sets of paths (e.g. there are five personality variables) in the models actually estimated and tested. (The individual elements of this model will be addressed in more detail below.) First, however, the need for a more advanced statistical modelling approach in this research area (as opposed to the ordinary correlation methods typically employed) will be commented on briefly.

Model specification consists of determining which variables to include in a model, as well as which variables are independent, intervening or dependent. In contrast to regression analysis (in which the relationship between a set of independent variables and a dependent variable is analysed), structural equation modelling is a method for studying the specific theoretical relationships between variables, both direct and indirect ‘effects’ (Blalock, 1971; Wright, 1934). The indirect effects of a variable are mediated by at least one intervening variable, and the sum of the direct and indirect effects is the total effect. For example, in addition to the direct relationship between personality variables and symptom reporting (effect f in Figure 1), the indirect effect of personality through distress level (effect eb) or through medical status (effect dc) can be assessed. Thus, structural equation modelling makes possible the modelling of complex relationships posited by theory.

Turning to research on NA and health, one important issue pertains to the differential effects of transient distress level (state NA) vs Neuroticism (trait NA) on health-related variables. The existent literature focuses almost exclusively on the contributions of NA as a stable trait. However, Watson and Pennebaker’s (1989) study also included state NA measures, i.e. scales constructed from items asking how subjects felt today or during the past few weeks. The results indicated, first, that these measures correlated significantly (in the 0.20–0.50 range) with self-rated health, and second, that the magnitude of this association was unaffected by the particular mood scale or health measure used.

![Figure 1. Initial (saturated) model.](image-url)
Unfortunately, the effect of state NA on self-rated health, controlling for trait NA as well as relevant extraneous variables, was not assessed. In the present context, a substantial effect of the subjects’ current distress level on somatic complaints is expected (effect b in Figure 1). The question is whether there are additional effects of trait NA on symptom reporting, both direct effects (effect f) and indirect effects (through state NA, i.e. effect eb).

Another important issue is to what extent the NA–somatic complaints relationship can be accounted for by more basic psychobiological response dispositions. Studies of immune system or endocrine system functioning and trait NA measures have yielded inconsistent results, although the majority suggest that in normal individuals activity in these physiological systems is largely unrelated to NA (Vassend, 1994; Watson & Pennebaker, 1989; Zuckerman, 1991). One of the most thorough investigations of psychophysiological differences (autonomic and brain activity measures) between those high and low in trait NA was carried out by Fahrenberg and co-workers (Fahrenberg, 1992). In essence, they failed to uncover any consistent psychophysiological differences. For example, in two independent predictive studies (Fahrenberg, Walschburger, Foerster, Myrtek, & Müller, 1983; Fahrenberg & Foerster, 1982), NA as well as somatic complaints scores failed to predict individual differences in state and reaction variables of psychophysiological activation processes reliably.

Despite these essentially negative results from psychobiologically oriented studies, extensive research has shown consistent effects on self-assessed health from such variables as number of illnesses or medical conditions, duration of illness, and disability and activity limitations (e.g. Moum, 1992; Smith et al., 1995), even when NA level is controlled for (effect c in Figure 1). Findings reported by Vassend (1994) showed that presence of chronic disease, injury or physical disability were significantly associated with self-reported somatic complaints in regression models also including NA, health behaviour indicators and sociodemographic variables. Such results are supported by studies reporting significant correlations between self-rated and physician-rated health (e.g. Linn & Linn, 1980), although the modest magnitude of the correlations should be kept in mind.

As already touched on, there is generally little evidence that medical problems, even chronic disease, lead to higher trait NA levels. Conversely, extensive research has shown that NA is virtually unrelated to actual, long-term disease outcomes (Vassend, 1994; Watson & Pennebaker, 1989). Certainly, the presence of chronic illness and the uncertainty and threat it poses may affect a person’s emotional state (e.g. particularly regarding anxiety and depression), but most individuals seem to adapt to even serious medical conditions. On the other hand, high NA levels may lead to increased attention to bodily condition and a lower threshold for pain and other symptoms. For example, as concluded by Costa and McCrae (1985a) in their study of subgroups of patients with signs of coronary heart disease (CAD), Neuroticism appears to affect CAD-related complaints, and complaints may lead to diagnosis (effect d in Figure 1), but Neuroticism does not seem to lead to heart disease. Moreover, medical condition and distress is expected to be correlated even after the effects of the independent variables are accounted for (i.e. the residuals or errors of these variables are correlated; see parameter a in Figure 1).

Decades of research have now shown conclusively that smoking, alcohol abuse and obesity constitute serious health risks. For example, it has been argued that smoking is the greatest single cause of preventable death in the US and may also be the chief cause of death when all causes are considered (e.g. McGinnis, Richmond, Brandt, Windom, & Mason, 1992). Thus, these risk factors are possibly related to self-assessed health via their impact on the individual’s medical condition (effect jc). Although both alcohol abuse and obesity may have obvious negative psychological and social consequences for the individuals who have these problems and others who are involved, it is uncertain whether, or to what degree, such health-compromising behaviours are related to changes in distress level (effect k).

A number of benefits of physical exercise on physical health have been documented (e.g. Alpert, Field, Goldstein, & Perry, 1990). In addition, results from studies of effects of aerobic exercise on psychological factors have been characterized as ‘cautiously positive’ (Taylor, 1995). For instance, regular exercise appears to reduce stress, anxiety and depression (Plante &
Rodin, 1990). Hence, physical exercise may be related to symptom reporting through altered distress level (effect kb) as well as medical condition (effect jc). Whether there is a direct effect on symptom reporting (effect l) is more uncertain, however.

Another question of importance in the present context is whether other established personality dimensions are related, directly or indirectly, to symptom reporting. It would be of considerable interest to analyse somatic symptom dimensions within the context of comprehensive personality trait conceptions, and the five-factor model (the ‘Big Five’) in particular (Costa & McCrae, 1985b, 1989). Although there are dissenting views (e.g. Block, 1995), as maintained by Saucier and Goldberg (1996) the Big Five factors seem to provide a set of personality dimensions that parsimoniously and comprehensively describe most individual differences. A correlational study reported by Costa and McCrae (1987) showed that the Neuroticism dimension on the NEO Personality Inventory, but not the other Big Five dimensions, was associated with the reporting of physical complaints. However, in this study simple correlational analyses were extensively used and no statistical control of relevant extraneous variables was performed. To our knowledge, no replication and extension of this study has been reported, although a host of investigations of associations between stress, symptom reporting and personality traits (derived from alternative personality conceptions) are described in the literature (for reviews, see e.g. Fahrenberg, 1992; Taylor, 1995).

Much theorizing has occurred about factors outside the medical model and health psychology research which may have a bearing on self-assessment of health (Cockerham, 1995). In particular, there has been a sustained interest in the frequently observed effects of age, sex and socioeconomic factors such as education and income. Recent Norwegian studies, based on nationwide representative samples of the adult population, have shown that both NA and self-reported physical symptoms are correlated with gender, age and social background variables (Vassend, 1994). An important question is whether the sociodemographic variables exert their effects on self-reported health primarily, or maybe exclusively, through medical variables (effect gc) and distress level (effect hb). Observing a relationship between sociodemographic variables and self-reported health, even when the effects of medical variables and NA are controlled for (effect i), forces us to start searching for factors that bypass the health status, health behaviour and personality variables.

Summing up, available research indicates that both NA and medical condition have a causal impact on somatic symptom reporting. The correlated errors of distress level and self-assessed medical condition can be interpreted as due to emotional effects of disease or functional impairment, changes in symptom perception associated with higher distress level, or both.

The primary aim of the study was to assess the relationship between distress level and medical condition on the one hand, and somatic symptoms on the other when sociodemographic and other relevant variables were included in the analysis. To achieve this, the effects in the full (saturated) model, shown in Figure 1, were first estimated and tested.

The second aim of the study was to assess model fit when effects of the independent and intervening variables were systematically excluded. First, the parameters corresponding to paths a, b and c in Figure 1 were set to zero, one at a time. In a similar manner, the effects of blockwise exclusion of personality, sociodemographic and health behaviour variables on NA level, medical status and complaints were investigated.

A third aim was to develop more parsimonious models with acceptable model fit as well as defensible theoretical properties. First, a model comprising only the significant effects from the full model was assessed. In this respecified model, various effects, both indirect and direct, were estimated and tested. Finally, a simple predictive model including Neuroticism as the only independent variable (in addition to the intervening and dependent variable) was assessed.

**Method**

**Participants**

Data were collected using a two-stage cluster sampling design (Haugenes, 1984). The sample comprised 546 women (mean age 37.0 years, SD = 15.0) and 522 men (mean age 37.3 years, SD = 15.2) and was representative of the non-institutionalized Norwegian population aged 15 years.
and above. Initially, about 1200 individuals were contacted and asked to participate in the study. Thus, the response rate was about 90 percent, which is highly satisfactory in survey studies like this.

**Measures and procedures**

All data were collected by trained interviewers. The participants were first given a brief oral orientation about the project. If consent for participation was obtained, the subject was required to answer the questionnaire items in writing. The participants were told that the primary aims of the study were: (1) to collect information about bodily and emotional complaints in the general population, and (2) to study a Norwegian version of a well-known American personality inventory. The participants were instructed to fill in the questionnaires alone, preferably when sitting undisturbed in a separate room. If questions should arise, the interviewer referred to the written instructions introducing and explaining the questionnaires. No attempt was made to interpret or clarify questions for the respondents.

**Symptom Checklist 90 Revised (SCL-90-R)**

This instrument is comprised of 90 items, each rated on a five-point scale of distress (Derogatis, 1983). Respondents are asked to indicate how they have felt ‘during the past seven days’. The SCL-90-R is usually scored on nine primary symptom dimensions: Somatization, Obsessive-compulsive; Interpersonal sensitivity; Depression; Anxiety; Hostility; Phobic anxiety; Paranoid ideation; and Psychoticism. The Global Severity Index (GSI), which is the subject’s mean score on the instrument, is a widely used global index of distress.

In order to avoid item overlap between the SCL-90-R dimensions and the somatic complaints scales, items with reference to somatic symptoms or sensations were excluded. Thus, the Somatization scale, in addition to three items (out of 13) from the Depression scale and two items (out of 12) from the Anxiety scale were left out. These items were: Loss of sexual interest or pleasure; Feeling low in energy or slowed down; Crying easily; Trembling; and Heart pounding and racing. To obtain a single measure of the respondent’s current distress level, a modified GSI score (based on items from the eight remaining symptom scales) was calculated. Cronbach’s alpha, a lower bound for the reliability of a composite scale, was 0.95. The Norwegian SCL-90-R version is described in more detail by Vassend and co-workers (Vassend, Lian, & Andersen, 1992; Vassend & Skrondal, in press).

**The NEO-PI Personality Inventory (NEO-PI)**

The inventory consists of 180 items plus a validity question (Costa & McCrae, 1985b). The Big Five dimensions measured by the instrument are most frequently labelled Extraversion (E), Agreeableness (A), Conscientiousness (C), Neuroticism (N) and Openness to experience (O). In addition, measures of more specific traits, called facets, have been developed. Each of the N, E and O domain scales is composed of six eight-item subscales that measure these specific facets. The facet scales were not included in the present investigation, but the scale names give an indication of the conceptual content of the broad domain scales. The facets of N are Anxiety, Hostility, Depression, Self-consciousness, Impulsiveness and Vulnerability; the facets of E are Warmth, Gregariousness, Assertiveness, Activity, Excitation seeking and Positive emotions; and the facets of O are Fantasy, Aesthetics, Feelings, Actions, Ideas and Values. The domains A and C are measured by global 18-item scales. Cronbach’s alpha for the N, E, O, A and C domains were, 0.89, 0.82, 0.85, 0.71 and 0.78, respectively (for more information about the Norwegian NEO-PI version, see Vassend & Skrondal, 1995, 1996, 1997).

**The Giessen Symptom Checklist (GSCL)**

The Norwegian version of the GSCL includes a total of 50 items. It is scored on four subscales, each comprising six items (Brähler & Scheer, 1983): (1) Weakness-fatigue (including the items Physical weakness, Excessive need for sleep, Tendency to rapid exhaustion, Tiredness, Feeling numb or benumbed, Listlessness); (2) Gastrointestinal complaints (Pressure or heaviness in the stomach, Vomiting, Nausea, Belching, Heartburn, Stomach aches); (3) Cardiac complaints (Heavy, rapid or irregular heart-throbbing, Dizziness, Sensation of tightness, choking or lumpiness in the throat, Twinges, pains, or aching in the chest, Attacks of breathlessness, Sudden bouts of heart trouble); and (4) Musculoskeletal pains (Pains in joints or limbs, Backache, Pains in neck or shoulders,
Headaches, Heaviness or tiredness in the legs, Head pressure). A total score comprising all the 24 items from the subscales is also calculated. In the present context this total score will be used in most analyses. In congruence with the original German studies, Cronbach’s alpha coefficients in the 0.70–0.80 range have been demonstrated for the four subscales, and a coefficient of 0.90 for the total score (see also Vassend, Lian, & Andersen, 1992). As noted below, although it is doubtful that somatic symptom reporting can be conceived as a unitary and latent trait, these relatively high alpha values indicate that the symptoms comprising the GSCL scales are highly correlated.

Medical condition A set of health status indicators was adopted from the large-scale Norwegian Health Survey 1985, performed by the Central Bureau of Statistics (Bjørnøy, 1987; Moum, 1992). An index was constructed by summing the scores on the following variables: (1) presence of known medical disease (scored 1—yes, or 0—no); (2) reduced activity or days in bed due to illness (acute or chronic) or injury for the two-week period preceding the interview (yes/no); and (3) presence of lasting functional impairment, such as ambulatory or sensory problems (yes/no).

Health behaviour variables The following indicators were used:

1. Frequency of physical exercise (moderate- to high-intensity exercise, causing breathlessness and sweating, for 20 minutes or more), rated on a five-point scale ranging from 0 (never/very seldom exercise) to 4 (exercise four times or more per week).
2. Consumption of alcohol, rated on a six-point scale ranging from 0 (never/very seldom drink alcohol) to 6 (drink alcohol four times a week or more).
3. Smoking, scored 1 (regular smoker) and 0 (do not smoke).
4. Body mass index. On the basis of the subjects’ height and weight, the body mass index (BMI) was calculated using the formula BMI = weight/(height)^2 = kg/m^2 (Stensland & Margolis, 1990). The BMI has emerged as a useful means of identifying individuals at a higher risk of mortality and morbidity related to their obesity (NIH 1985). In addition, the index has been used as a criterion to measure undernutrition and anorexia nervosa and mortality risk in the underweight elderly (Mattila, Haavisto, & Rajala, 1986).

Sociodemographic variables These variables were age (12 age groups), sex, education (four levels) and family income (20 levels).

Modelling and statistical methods It can be argued that structural equation modeling with observed variables has obvious limitations since the variables are assumed to be perfectly measured. However, when the latent-observed status of important study variables in a theoretical model is obscure, a model with observed variables may be preferred to structural equation models with measurement models for latent variables. For example, although various somatic complaints are correlated, and symptom reporting is correlated with NA, we think it dubious to claim that symptom reporting should be regarded essentially as a latent variable or ‘trait’. Moreover, the problems involved in substituting scores for latent traits are reduced when there are many items and/or the reliabilities of the items are high (Skrondal & Laake, 1997).

Several of the variables in the present study were non-normally distributed. Hence, it can be argued that the use of maximum likelihood estimates and their associated standard errors and goodness of fit measures may not be justified. In this case the so-called asymptotically distribution free method (ADF; Browne, 1984) has been advocated. Although the ADF methodology performs reasonably well with small models and large samples, in larger models with small- to medium-sized samples it can produce misleading results (see e.g. Muthén & Kaplan, 1985, 1992). By Monte Carlo simulations, Curran, West, and Finch (1996) found that whereas the normal theory maximum likelihood chi-square statistics were increasingly overestimated with increasing non-normality, ADF showed no evidence of bias at large sample sizes (i.e. 500 or 1000). Hu, Bentler, and Kano (1992) demonstrated that, for a certain type and size of model, the Satorra–Bentler scaled chi-square statistic (Satorra & Bentler, 1988) also performed well with smaller sample sizes. Clearly, further research is needed to determine the relative
advantages and disadvantages of these test statistics at different sample sizes, under different types and sizes of models, and under different distributions of the observed variables (see also Yuan & Bentler, 1997). In the present study, the variable to subject ratio was judged to be within acceptable limits for ADF methodology. However, all models were also estimated and tested with the Satorra–Bentler method. On the whole, the two methods produced highly similar results with regard to parameter estimates, significance tests for the parameters and goodness of fit indices.

The full model depicted in Figure 1 and subsequent respecified models were estimated and tested using the LISREL 8.20 program (Jöreskog & Sörbom, 1998). In the full model as well as in the respecified models, the independent variables are freely correlated. Several criteria of model fit were used (see Bollen & Long, 1993): The likelihood ratio statistic ($\chi^2$) and $\chi^2$/degrees of freedom; the goodness of fit index (GFI; Jöreskog & Sörbom, 1989); the root mean square residual (RMSR) in correlation units (Jöreskog & Sörbom, 1989); the normed fit index (NFI; Bentler & Bonett, 1980; Tucker & Lewis, 1973); and finally the root mean square error of approximation (RMSEA; Steiger, 1990). In a discussion of goodness of fit indices in structural equation modelling, Bollen and Long (1993, pp. 1–9) emphasize, first, that no single measure of overall fit should be relied on exclusively, and second, that the fit of the components of a model should not be ignored. By components of the model they refer to specific aspects, such as the $R^2$s of equations and the magnitudes of coefficient estimates (see also Tanaka, 1993). In congruence with this we have chosen to include the $R^2$ (coefficient of determination) along with the other goodness of fit indices, as well as the parameter estimates for some of the models.

Generally speaking, a well-fitting model should ideally have a non-significant $\chi^2$ statistic, or at least have evidence of a $\chi^2$/d.f. ratio between 2 and 5 with lower values indicative of greater fit (Marsh & Hocevar, 1985), a RMSR value of 0.05 or lower, and GFI and NNFI values of 0.90 or greater. Browne and Cudeck (1993) suggest that a value of 0.05 of the RMSEA indicates a close fit, and values up to 0.08 represent reasonable errors of approximation in the population. As maintained by Jöreskog (1969), in practice it is more useful to regard the $\chi^2$ statistic as a measure of fit rather than as a test statistic. Thus, on this view the $\chi^2$ is a measure of the overall fit of the model to the data. It turned out, however, that GFI and NNFI values in the 0.95–1.00 range were found for almost all models tested. Hence, since these goodness of fit indices were of little use in the present context, the likelihood ratio test, in addition to the RMSR, RMSEA and $R^2$, were employed as a basis for model assessment and selection.

Results

The correlations among the variables used in the study are shown in Table 1. For the present purposes, it should be noted that somatic complaints were most strongly correlated with the NA markers distress and Neuroticism, as well as medical condition.

To assess the effect of NA and medical status on somatic complaints, controlling for the total set of independent variables, standardized regression coefficients for the full (saturated) model were estimated (Table 2). As can be seen, highly significant effects of both current distress level and medical status were found. Moreover, the error covariance for distress level and medical status was significant, indicating that these variables are correlated after the effects of the independent variables are accounted for. It is noteworthy that no direct effect of Neuroticism on symptom reporting was found. Interestingly, significant direct effects of BMI and physical exercise (but not smoking and use of alcohol) were found. None of the sociodemographic variables were found to have significant direct effects.

To assess the consequences of choice of health indicator for essential model parameters, additional analyses using each of the GSCL subscales as dependent variables in full (saturated) models were performed (results not shown). As anticipated, these analyses revealed differences in the amount of explained variance ($R^2$ values) and in the detailed structural relationships between the variables in the model. However, as judged by the estimated standardized coefficients, the effects of distress level and medical condition were by far the most substantial ones in all four models. Furthermore, entering the three separate indicators of medical condition
Table 1. Correlations, means and standard deviations (SD) for the variables used in the study

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</tr>
<tr>
<td>9.</td>
<td>Sex</td>
<td>-0.09</td>
<td>-0.06</td>
<td>-0.09</td>
<td>-0.18</td>
<td>-0.09</td>
<td>-0.23</td>
<td>-0.10</td>
<td>-0.08</td>
<td></td>
<td></td>
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<tr>
<td>10.</td>
<td>Age</td>
<td>0.05</td>
<td>0.15</td>
<td>-0.15</td>
<td>-0.23</td>
<td>-0.29</td>
<td>0.09</td>
<td>-0.19</td>
<td>0.21</td>
<td>0.02</td>
<td>0.34</td>
<td>-0.01</td>
<td>0.04</td>
<td>-0.22</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>11.</td>
<td>Education</td>
<td>-0.11</td>
<td>-0.11</td>
<td>-0.06</td>
<td>-0.07</td>
<td>0.21</td>
<td>0.02</td>
<td>0.34</td>
<td>-0.01</td>
<td>0.04</td>
<td>-0.22</td>
<td></td>
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<td></td>
<td></td>
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<tr>
<td>12.</td>
<td>Family income</td>
<td>-0.13</td>
<td>-0.18</td>
<td>-0.20</td>
<td>-0.19</td>
<td>0.02</td>
<td>0.00</td>
<td>-0.03</td>
<td>0.13</td>
<td>0.13</td>
<td>0.07</td>
<td>0.23</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>13.</td>
<td>Physical exercise</td>
<td>-0.16</td>
<td>-0.10</td>
<td>-0.06</td>
<td>0.00</td>
<td>0.21</td>
<td>0.01</td>
<td>0.18</td>
<td>-0.02</td>
<td>0.08</td>
<td>-0.16</td>
<td>0.12</td>
<td>0.01</td>
<td></td>
<td></td>
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<tr>
<td>14.</td>
<td>Smoking</td>
<td>0.09</td>
<td>0.03</td>
<td>0.09</td>
<td>0.08</td>
<td>0.05</td>
<td>-0.02</td>
<td>0.01</td>
<td>0.00</td>
<td>0.01</td>
<td>-0.05</td>
<td>-0.11</td>
<td>0.01</td>
<td>-0.16</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>15.</td>
<td>Use of alcohol</td>
<td>-0.06</td>
<td>-0.10</td>
<td>-0.01</td>
<td>-0.04</td>
<td>0.13</td>
<td>-0.06</td>
<td>0.13</td>
<td>-0.04</td>
<td>0.20</td>
<td>-0.09</td>
<td>0.21</td>
<td>0.14</td>
<td>0.03</td>
<td>0.17</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16.</td>
<td>BMI</td>
<td>0.15</td>
<td>0.08</td>
<td>-0.01</td>
<td>-0.07</td>
<td>-0.10</td>
<td>-0.06</td>
<td>-0.10</td>
<td>-0.01</td>
<td>0.21</td>
<td>0.29</td>
<td>-0.09</td>
<td>0.02</td>
<td>-0.09</td>
<td>-0.02</td>
<td>0.00</td>
<td>23.52</td>
</tr>
</tbody>
</table>
(instead of the sum score) revealed significant effects of each indicator when the GSCL sum score was used as dependent variable.

Next, the effects of the independent variables on each of the intervening variables were examined. Inspecting the estimated standardized coefficients in Table 2, we notice that the Big Five dimensions Neuroticism and Extraversion were significantly related to both distress and medical status, whereas Conscientiousness was significantly associated with distress and Agreeableness with medical status. As was anticipated, the relationship between Neuroticism and distress level was highly significant. Of the sociodemographic variables, family income is related to both intervening variables (lower income is associated with a higher probability of reporting illness/functional impairment, and distress symptoms). As expected, a significant positive effect of age on medical condition was found (and a negative effect on distress symptoms). However, the health behaviour indicators were unrelated to distress level and medical status, with the exception of a significant association between physical exercise and distress.

In the next set of analyses, we examined the overall fit of the model to the data when effects of the independent and intervening variables were systematically excluded (Table 3). As can be seen, neither of the intervening variables, nor the error covariance term, could be excluded from the model without an ensuing dramatic drop in overall fit of the model to the data (Models 1, 2, and 3). As noted above, a strong direct effect of Neuroticism on distress level, but not on somatic symptom reporting, was found. In fact, no reduction in the $R^2$ value occurred when all the direct paths from the Big Five dimensions to symptom reporting were set to zero in the model (Model 6), and the model fit was satisfactory as judged also by the likelihood ratio test. On the other hand, the removal of the path from personality to distress level (Model 5), or to medical status (Model 4), resulted in a substantial drop in model fit, particularly for the first of these two models.

Next, removing the effects of sociodemo-

### Table 2. Estimated standardized coefficients and $R^2$ values for the full (saturated) model

<table>
<thead>
<tr>
<th>Independent and intervening variables</th>
<th>Intervening variables</th>
<th>Dependent variable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Medical condition</td>
<td>Distress (state NA)</td>
</tr>
<tr>
<td>Intervening variables (a) (Error cov.)</td>
<td>0.08***</td>
<td>0.58***</td>
</tr>
<tr>
<td>Distress (state NA)</td>
<td>0.08**</td>
<td>0.57***</td>
</tr>
<tr>
<td>Medical condition</td>
<td>0.08</td>
<td>0.00</td>
</tr>
<tr>
<td>Personality (d) (e) (f)</td>
<td>0.09**</td>
<td>0.00</td>
</tr>
<tr>
<td>Neuroticism (trait NA)</td>
<td>-0.08*</td>
<td>0.00</td>
</tr>
<tr>
<td>Extraversion</td>
<td>0.16***</td>
<td>0.00</td>
</tr>
<tr>
<td>Agreeableness</td>
<td>0.04</td>
<td>0.05</td>
</tr>
<tr>
<td>Openness</td>
<td>0.01</td>
<td>0.09**</td>
</tr>
<tr>
<td>Conscientiousness</td>
<td>0.01</td>
<td>0.09**</td>
</tr>
<tr>
<td>Sociodemographic variables (g) (h) (i)</td>
<td>0.02</td>
<td>0.03</td>
</tr>
<tr>
<td>Sex</td>
<td>0.12**</td>
<td>-0.07**</td>
</tr>
<tr>
<td>Age</td>
<td>0.02</td>
<td>0.00</td>
</tr>
<tr>
<td>Education</td>
<td>-0.16***</td>
<td>-0.10**</td>
</tr>
<tr>
<td>Family income</td>
<td>0.06</td>
<td>-0.05*</td>
</tr>
<tr>
<td>Health behaviour (j) (k) (l)</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>Physical exercise</td>
<td>-0.05</td>
<td>0.02</td>
</tr>
<tr>
<td>Smoking</td>
<td>0.04</td>
<td>0.03</td>
</tr>
<tr>
<td>Use of alcohol</td>
<td>0.04</td>
<td>0.04</td>
</tr>
<tr>
<td>BMI</td>
<td>0.04</td>
<td>0.04</td>
</tr>
</tbody>
</table>

$R^2 = 0.10$ $R^2 = 0.37$ $R^2 = 0.51$

**Notes.** Letters in parentheses (a, b, c, etc.) correspond to paths in Figure 1. The (a) parameter is the error covariance for the intervening variables.

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$. 
graphic variables on medical condition, distress, and the somatic complaints variable were studied (Models 7, 8, and 9, respectively). The most pronounced loss in model fit occurred when the effect of sociodemographic variables on medical condition was removed, although only marginal reductions in $R^2$ were observed. As regards the other two models, the model fit was satisfactory as judged by all the goodness of fit indices, with the exception of the $\chi^2/d.f.$ statistic for Model 8.

Turning to the health behaviour indicators, all effects (with the possible exception of the path between health behaviour and somatic complaints) had negligible importance as judged by the goodness of fit indices, with the exception of the $\chi^2$ statistic for Model 8.

Table 3. Goodness of fit indices and $R^2$ values for models in which blocks of independent variables are excluded, and one alternative model

<table>
<thead>
<tr>
<th>Model</th>
<th>Likelihood ratio test</th>
<th>$\chi^2/d.f.$</th>
<th>RMSEA</th>
<th>RMSR</th>
<th>$R^2$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intervening variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1. DIS-MED Error cov.</td>
<td>(a)</td>
<td>10.13</td>
<td>1</td>
<td>&lt;0.01</td>
<td>10.13</td>
</tr>
<tr>
<td>2. DIS-COMP</td>
<td>(b)</td>
<td>76.70</td>
<td>1</td>
<td>&lt;0.001</td>
<td>76.70</td>
</tr>
<tr>
<td>3. MED-COMP</td>
<td>(c)</td>
<td>45.46</td>
<td>1</td>
<td>&lt;0.001</td>
<td>45.46</td>
</tr>
<tr>
<td>Personality</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. NAEOC-MED</td>
<td>(d)</td>
<td>29.26</td>
<td>5</td>
<td>&lt;0.001</td>
<td>5.85</td>
</tr>
<tr>
<td>5. NAEOC-DIS</td>
<td>(e)</td>
<td>138.85</td>
<td>5</td>
<td>&lt;0.001</td>
<td>27.77</td>
</tr>
<tr>
<td>6. NAEOC-COMP</td>
<td>(f)</td>
<td>9.05</td>
<td>5</td>
<td>0.11</td>
<td>1.81</td>
</tr>
<tr>
<td>Sociodemographic variables</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. SD-MED</td>
<td>(g)</td>
<td>28.43</td>
<td>4</td>
<td>&lt;0.001</td>
<td>7.11</td>
</tr>
<tr>
<td>8. SD-DIS</td>
<td>(h)</td>
<td>18.30</td>
<td>4</td>
<td>&lt;0.01</td>
<td>4.58</td>
</tr>
<tr>
<td>9.48 SD-COMP</td>
<td>(i)</td>
<td>7.65</td>
<td>4</td>
<td>0.11</td>
<td>1.91</td>
</tr>
<tr>
<td>Health behaviour</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. HB-MED</td>
<td>(j)</td>
<td>10.04</td>
<td>4</td>
<td>0.04</td>
<td>2.51</td>
</tr>
<tr>
<td>11. HB-DIS</td>
<td>(k)</td>
<td>8.88</td>
<td>4</td>
<td>0.06</td>
<td>2.22</td>
</tr>
<tr>
<td>12. HB-COMP</td>
<td>(l)</td>
<td>35.62</td>
<td>4</td>
<td>&lt;0.001</td>
<td>8.91</td>
</tr>
<tr>
<td>13. Sign. Parameters (Table 4)</td>
<td></td>
<td>16.59</td>
<td>10</td>
<td>0.08</td>
<td>1.66</td>
</tr>
</tbody>
</table>

Notes. Letters in parentheses correspond to paths in Figure 1.
SD—Sociodemographic variables; COMP—Somatic complaints; DIS—Distress (NA); MED—Medical condition; HB—Health behaviour; NAEOC—Neuroticism, Agreeableness, Extraversion, Openness, Conscientiousness.

Turning to the health behaviour indicators, all effects (with the possible exception of the path between health behaviour and somatic complaints) had negligible importance as judged by the goodness of fit indices, with the exception of the $\chi^2$ statistic for Model 8.

In the final set of analyses, a model including only significant parameters from the full model was first estimated. Interestingly, in this specified model no pronounced reductions in explained variance in distress level and medical status, or complaints scores, were found (Model 13). Moreover, all the fit indices indicated an excellent fit of the model to the data. The direct and indirect effects of the variables in the model are shown in Table 4.

The most pronounced effects on the dependent variable are the direct effects of distress level and medical condition, as well as the indirect effect of Neuroticism. Thus, although Neuroticism has no direct effect on somatic symptom reporting, it indirectly affects such reporting through its influence on the intervening variables. When the path from Neuroticism to distress level was removed, the indirect effect of Neuroticism through medical condition was not significant (results not shown). Thus, the indirect effect of Neuroticism is mediated by current distress level. It should be noted that the NEO-PI dimensions Extraversion, Agreeableness and Conscientiousness also evidenced significant indirect effects on symptom reporting. Similarly, family income (but not age) had a significant indirect effect on the dependent variable.
To clarify the predictive power of NA for symptom reporting, a model based on the four variables Neuroticism, medical condition, distress and somatic complaints was estimated and tested (the NA Model; see Figure 2).

Interestingly, as compared with the full model based on all variables, no pronounced reduction in the coefficient of determination occurred ($R^2 = 0.48$). Furthermore, the model fit was highly satisfactory ($\chi^2 = 0.52$, d.f. = 1, $p = 0.47$).

**Discussion**

The evidence concerning the relationship between NA, medical condition and self-reported somatic complaints reveals what is by now a well-known pattern: high NA individuals (as indicated by both Neuroticism and current distress level) report more somatic complaints, and somatic complaints are consistently linked to the occurrence of illness. However, when current distress level was included in the model, the effect of Neuroticism disappeared. Importantly, the indirect effect of Neuroticism (through current distress level) was still highly significant. As expected, a modest but significant correlation between the errors of distress and medical condition was found. Furthermore, the results indicated unequivocally that both these variables had substantial effects on symptom reporting.

In congruence with much previous research, the correlation between Neuroticism and medical condition was very weak (Table 1). Admittedly, in some research areas the results are inconsistent rather than simply negative (e.g. associations between NA facets and hypertension, see e.g.

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**Figure 2.** The NA model.
Jorgensen, Johnson, Kolodziej, & Schreer, 1996). However, taken together the research literature does not suggest that a strong association between trait NA and medical illness and dysfunction, or risk factors, should be expected. Interestingly, several direct and indirect effects of the other Big Five domains, with the exception of Openness, were demonstrated. However, these effects were generally small as compared with the effects of Neuroticism, current distress level and medical condition. This was evident as judged by the parameter estimates in the saturated model and respecified models, as well as by the $R^2$ values and goodness of fit indices for models in which sets of personality variables were excluded. On the other hand, several of the effects of the Big Five domains were comparable to the effects of other independent variables in the models that were assessed. This finding amounts to a correction and an extension of Costa and McCrae’s (1987) study (based on a considerably smaller sample not representative of the general population), in which it was concluded that none of the domain scores on NEO-PI, beyond Neuroticism, is related to somatic complaints. As pointed out earlier, the statistical methods most often used in studies of the NA–somatic complaints relationship have been zero-order correlations, partial correlations and, in some instances, regression analysis. Ignoring the indirect effects that a variable may exert through other variables, however, we may be grossly off in the assessment of its overall effects. In the present context, both the direct and indirect effects of the Big Five domains (with the possible exception of Openness) should obviously be included in a correctly specified model.

Although the importance of NA for the relations between essential study variables in models of self-assessed health should be evident, it should be emphasized that inclusion of NA merely reduced, rather than eliminated, most of these relations. In particular, the effect of medical condition on symptom reporting, although somewhat reduced, was highly significant after inclusion of distress level. Thus, we found little basis for the claims that because both self-reported symptoms and many health-related predictor variables are correlated with NA, it is most parsimonious to attribute the observed relations between self-reported health and these other variables to the spurious influence of NA (e.g. Watson & Pennebaker, 1989).

In Europe and elsewhere in the world, socioeconomic status is one of the most consistent predictors of a person’s health and life expectancy (Cockerham, 1995), a finding that has been demonstrated even in Scandinavian countries where social equality in living conditions is among the most pronounced in the world (e.g. Diderichsen, 1990; Lahelma & Valkonen, 1990). In agreement with this research, significant effects of sociodemographic variables were found also in the present study. Family income as well as age evidenced both direct and indirect effects on symptom reporting. Moreover, the well-known relationship between gender and health complaints was found (i.e. slightly poorer self-ratings of health for women; see Table 1). On the whole, however, one is struck by the lack of predictive power contained in the sociodemographic variables after essential study variables have been included in the analysis. Similar findings have been reported in a host of previous studies (see e.g. Idler & Angel, 1990; Moum, 1992; Wright, 1987). For example, the effect of gender on symptom reporting was generally small and statistically non-significant in the models tested. Again, such results are in agreement with accumulated research, indicating that there are practically no sex differences in self-rated health when adequate control variables are introduced (e.g. Idler & Angel, 1990; Moum, 1992).

Turning to the health behaviour variables, insignificant or weak effects were generally observed. Again, these results replicate findings that have been frequently reported before (e.g. Vassend, 1989; Watson & Pennebaker, 1989). Significant effects of physical exercise on distress and somatic complaints were observed. Interestingly, a direct effect of the BMI on symptom reporting was found. Thus, more somatic complaints are reported by overweight individuals, irrespective of their medical condition and distress level. No clear effects of smoking or use of alcohol were demonstrated, however.

In studies of NA and health, rather global indicators of self-assessed health or medical condition are used routinely, e.g. long lists of diverse somatic complaints that are simply added together, or a single medical illness index. Thus, it can be objected that when such global indi-
cators of essential variables are employed, possibly important structural distinctions are lost sight of. For instance, it is not unlikely that the relationships between independent, intervening and dependent variables will be somewhat different in models using distinct indicators of medical condition or somatic complaints. Although differences in terms of estimates and explained variance were observed across the additional models analysed, for our purposes the most substantial finding was that highly significant effects of both distress level and medical condition on symptom reporting were demonstrated, irrespective of the GSCL subscale entered as a dependent variable.

On the other hand, it can be argued that the use of SCL-90-R subscales as an indicator of current NA level needs more justification, particularly since some of these scales (e.g. Psychoticism) appear to tap a broader range of NA symptoms than is usually included in NA scales. However, it should be noted, first, that NA subsumes a broad range of aversive mood states (Watson & Clark, 1984) and no exhaustive definition of the construct has as yet been offered. Second, in reanalyses (results not shown) using a distress scale comprising more typical NA indicators from the SCL-90-R (e.g. anxiety, tension, sadness, worry, rumination) results almost identical to those reported here were found.

The basic model used in the present study (as shown in Figure 1), or variants of this model, can be viewed as reflecting a transactional theory of symptom reporting (see Deary et al., 1997; Lazarus & Folkman, 1987). Transactional theory lays out a clear causal flow from distal, e.g. general personality factors and background variables through intervening variables (e.g. distress and medical status) to health-related outcomes. The alternative to transactional theory can be termed negative affectivity theory (Deary et al., 1997), which merely assumes that self-reported somatic health and negative affect measures are indicators of a single underlying trait, somewhat like the somatopsychic distress of Watson and Pennebaker (1989). Thus, it can be argued that this more parsimonious model should be preferred to the transactional model. However, in the present study, which includes several personality variables (in addition to Neuroticism), as well as sociodemographic and health behaviour indicators, the conventional NA model is simply not adequate. Second, as mentioned above, on conceptual grounds it seems dubious that symptom reporting, and in particular the medical condition variable, can be conceived as reflecting a latent trait.

Although it is granted that a variant of the transactional model seems plausible in the present case, it can still be argued that the division of variables into independent, intervening and dependent is problematic. Some of the variables (like age and gender) are clearly independent, whereas personality traits are known to be highly stable and thus more likely to be cause than effect. On the other hand, other variables like health behaviours might just as well be considered outcome variables. For example, overweight (as indicated by BMI) may in itself cause symptoms and, possibly, more negative focusing on own body and bodily sensations. However, a high caloric intake may also be a means of reducing discomforting states associated with having somatic symptoms. It should be noted that the health behaviour indicators were included in the investigation primarily as control variables in the total model, so a detailed modelling of possible cause–effect relationships as regards these variables is beyond the scope of the study. It is also not necessary to assess the most essential relationships between study variables and the dependent variable, which is the main aim of the study.

A final objection that can be raised is that the study has failed to include a sufficiently broad range of indicators of illness and functional impairment to capture the real influence of ‘medical model’ variables on self-assessed health. However, results from investigations using detailed medical information obtained in comprehensive interviews indicate results very similar to our own. For example, results reported for a large, nationwide sample representative of the Norwegian adult population (Moum, 1992) indicated that medical variables were clearly the most powerful predictors of satisfaction with own health (assessed by a single question), as compared to sociodemographic variables. Entering a large block of illness and functional impairment indicators, R² values in the 0.20–0.30 range (depending on such factors as gender and age group) were typically demonstrated. The results from our own study indicated an R² of 0.16 when the medical status variable
was entered as the sole independent variable. Furthermore, reanalysing the same material used in Moum’s (1992) study, Vassend (1994) demonstrated that NA indicators (assessed by the Hopkins Symptom Check List), in addition to medical variables, were important predictors of satisfaction with own health as well as somatic complaints (a dependent variable not used in Moum’s study). Hence, the inclusion of a more fine-grained array of medical variables in the statistical models does not alter our substantive conclusions regarding the independent effects of NA on self-assessed health.

At this point we should remind ourselves of the fact that although health-compromising behaviours such as smoking, alcohol abuse and lack of exercise are related to actual, long-term disease outcomes (e.g. mortality, cardiac disease and cancer), they are not necessarily related, at least not strongly, to self-reported somatic symptoms or other health indicators based on self-assessment. Thus, the following generalization seems warranted: when measures based on self-assessment are employed as outcome variables, clearly the best predictors of health status are variables reflecting subjective and experiential dimensions, and in particular aspects of negative mood. Using biomedical indicators as outcome variables, on the other hand, the best predictors are evidently variables reflecting objective processes or conditions, both biological (e.g. genetic factors, gender differences), social (e.g. education, income) and behavioural (e.g. physical exercise, food intake).

The recognition of the low degree of correspondence between subjective and objective health indicators seems to bring with it a dualistic framing of the mind–body relationship. That is, the subjective world of mood and complaints is, so to speak, encapsulated from the realm of biology and medical disease. To assume that measures of somatic symptoms are direct reflections of organic conditions is a position characterized as ‘naive realism’ by Costa and McCrae (1985a). This position is naive from a medical point of view because it presupposes that individuals can correctly perceive, interpret and report their own bodily condition. It is naive also from a psychological point of view because it ignores the important role of personality dispositions, and NA in particular, in self-assessment of health.

Side-stepping the complex philosophical questions involved, we would just mention two issues which for us stand out in stark relief. The first is the psychobiological problem of identifying the underlying mechanisms that can account for the somatopsychic distress dimension itself, and which give rise to individual differences in NA (see e.g. Fahrenberg, 1992; Vassend, 1994; Watson & Pennebaker, 1989). The other issue pertains to the clinical relevance of variables that may moderate the relation between subjective and objective health, and the actual use of such information in clinical contexts. Accumulated research indicates that NA is implicated in various stress/psychosomatic conditions, and maybe pain problems in particular (e.g. Dworkin et al., 1992). Furthermore, the subjective dimensions of medical and mental health are in themselves of considerable interest, both theoretically and clinically. Whether regarded as anxiety, depression or general maladjustment, psychological distress is of central importance to health researchers and clinicians as an index of adjustment and mental health (Smith et al., 1995). Finally, as emphasized by Costa and McCrae (1987), NA is indirectly related to health through a variety of maladaptive behaviours, most dramatically seen in the elevated suicide and accidental death rates for psychoneurotics (Keehn, Goldberg & Beebe, 1974).

In conclusion, the main findings and implications of the study are, first, that the reporting of somatic symptoms—both relatively specific/localized and diffuse/global symptoms—constitutes part of a personality disposition and health/illness behaviour that goes beyond a narrow or ‘naive’ view of physical illness. Second, using diverse indicators of medical condition or self-assessed health does not substantially change structural relationships among the core elements of the basic model. Third, of the Big Five personality dimensions, Neuroticism (trait NA) is unquestionably the most important in the context of self-assessed health. It is noteworthy, however, that all the Big Five domains, with the exception of Openness, evidenced significant indirect effects on symptom reporting. Fourth, the effect of ‘medical model’ variables is still significant after controlling for NA, as are some of the health behaviour and sociodemographic variables. Leaving out NA, the medical status variable is clearly of greatest importance.
as judged by the parameter estimates in the models and the goodness of fit indices. Fifth, the leftover residue of predictive power, after Neuroticism and current distress level have been included in the various models, is weak tea indeed. These results should not be taken to indicate that behavioural risk factors or socio-economic variables are generally unimportant as predictors of an individual’s health status. What seems important, however, is that such variables evidently take on different causal roles in models using objective health indicators (i.e. medical pathology or dysfunction) as contrasted with self-assessed health (e.g. somatic complaints, satisfaction with own health) as outcome variables. Finally, although NA obviously permeates virtually every kind of subjective indicator of medical and mental health, but is at most only weakly associated with objective health indicators, it would be extremely short-sighted to conclude that it has essentially nothing to do with health and that it should accordingly be conceived as a nuisance variable. In congruence with Smith et al. (1995), we believe that a wiser strategy is to recognize NA as the substantively important variable it actually is, and to investigate its relations to health-related processes and outcome measures systematically.

References


