Big Five Personality Traits and Physician-Certified Sickness Absence

Gøril Kvamme Løset

OsloMet - Oslo Metropolitan University

Tilmann von Soest

University of Oslo and OsloMet - Oslo Metropolitan University

Author Note

Gøril Kvamme Løset, Norwegian Social Research (NOVA), OsloMet – Oslo

Metropolitan University, Oslo, Norway; Tilmann von Soest, PROMENTA Research Center,

Department of Psychology, University of Oslo, Oslo, Norway, and Norwegian Social Research

(NOVA), OsloMet – Oslo Metropolitan University, Oslo, Norway.

Please address any correspondence concerning this manuscript to Gøril Kvamme Løset,

Norwegian Social Research (NOVA), OsloMet – Oslo Metropolitan University, P.O. Box 4 St.

Olavs plass, NO-0130 Oslo, Norway. E-mail: goril.k.loset@oslomet.no. https://orcid.org/0000-

0003-3837-318X

Abstract

Although several studies show that personality traits are associated with absenteeism, few large-scale studies have examined these relationships prospectively, integrating survey data and register data on sickness absence. This study examines whether personality is associated with sickness absence, and whether health factors, gender, age, type of occupation and job satisfaction moderate this relationship. We combine survey data assessing the Big Five personality traits from a large sample of Norwegian employees aged 18–62 years ($N = 5,017$) with register data on physician-certified sickness absence up to four years after. Negative binomial regression analyses showed that extraversion was positively associated with subsequent sickness absence when controlling for several covariates, including health, work factors and previous spells of sickness absence. Neuroticism showed also significant positive associations with sick leave; however, the association diminished when accounting for previous spells of sickness absence. Moderator analyses demonstrated that age and type of occupation affected some of the associations between personality and sickness absence. The findings indicate that—in addition to general health promotion measures—specific interventions targeting individuals high in extraversion may be beneficial in reducing sick leave. How socio-demographic and work-related factors moderate the relationship between personality and sickness absence may be an interesting future research area.

Keywords: sickness absence, sick leave, personality, health, occupation

Big Five Personality Traits and Physician-Certified Sickness Absence

Sickness absence is considered a substantial burden in public expenditure and productivity loss. In European countries, per capita public expenditure on sick leave is comparable to public costs for unemployment benefits and the share of sick leave expenditure on overall social protection expenditure is with 9.8% particularly high in Norway, where the present study is conducted (Scheil-Adlung & Sandner, 2010). Although sickness absence is intended to be a health-promoting and work-inclusive measure, it is also associated with costs for the individual in terms of reduced income and career prospects, and being a gateway to permanent work disability (Markussen, 2012; Salonen et al., 2018). Moreover, sickness absence varies with gender, age and socio-economic status (Markussen et al., 2011; Mastekaasa & Melsom, 2014). Some of this variation is explained by social patterns in health, morbidity and work conditions (Löve et al., 2013; Markussen et al., 2011). Still, several studies suggest that a substantial part of the variation arises from individual factors that may predispose employees to sickness absence (Henderson et al., 2009; Markussen et al., 2011).

In the present study we use a combination of large-scale survey data and longitudinal register data on physician-certified sickness absence to examine to what extent personality is associated with sickness absence in a sample of Norwegian employees aged 18–62 years ($N =$ 5,017). Furthermore, we investigate whether these associations vary by health status, gender, age, type of occupation and job satisfaction.

Theoretical Considerations and Previous Research

"Sickness absence" is often conflated with the broader term "absenteeism" in the literature. In this paper, absenteeism refers to all failures to report for scheduled work (Johns,

2002), while sickness absence, or "sick leave", strictly covers absences from contracted work on the grounds of either self- or physician-certified health issues.

Individual-focused models highlight sickness absence as an expression of strain related to job and family situations, health problems and motivations to attend work that may "push" or "pull" the employee into sickness absence (see Allebeck & Mastekaasa, 2004a). For example, Steers and Rhodes' process model (1978) considers most sickness absence episodes as a combination of the ability and motivation to attend work where the ability is primarily impaired by illness or injury, while the motivation depends on job satisfaction and incentives or pressures related to economic, social or psychosocial factors. Empirical data indicate that motivational factors and pressures indeed are of importance. For example, large-scale Norwegian studies show that recovery rates from sickness absence rise substantially just prior to the exhaustion of sickness insurance benefits, thereby indicating that motivational factors and not health status alone determine sickness absence (Markussen et al., 2011).

Similarly, other process models consider sickness absence as a process in key stages, each with a complex set of factors with individual perceptions, beliefs and other psychosocial influences contributing to the progress. Stage progression, in the form of increasing occupational incapacity due to sickness symptoms, rests on the decision to remain at work despite symptoms or the decision that short-term sick leave and in other cases medically and culturally endorsed long-term sick leave is necessary (Henderson et al., 2011). Balance models of employee well-being additionally assume that the balance between job demands and job resources is important for the development of strain and motivation and their link to employee outcomes such as sick leave. Personal resources, including personality factors, may be particularly relevant for understanding individual variations in perceived job stress and may contribute to whether job

requirements and job resources lead to health deterioration processes (see Demerouti & Bakker, 2011). Both process and balance models thus consider individual difference variables as important factors in the complex course of sickness absence (Henderson et al., 2011), and personality as such can be important in explaining variations in sick leave decisions even when accounting for differences in somatic and mental health.

Personality is related to a broad array of important life outcomes, such as subjective well-being, intimate relationships, education and financial security (Ozer & Benet-Martínez, 2006; Soto, 2019). Personality has also been shown to be related to labour market outcomes including job attainment, occupational satisfaction and commitment (Ozer & Benet-Martínez, 2006; Soto, 2019). Sick leave may therefore be one of the mechanisms that link personality to poor outcomes in the labour market and there is a growing recognition that dispositional factors can predict work absence (Henderson et al., 2009; Judge et al., 1997; Störmer & Fahr, 2013).

The present study examines associations between physician-certified sick leave and the widely used Big Five personality dimensions. Broad personality dimensions are considered to be of substantial relevance for exposure, appraisal and coping with work stress and its health outcomes (see Grant & Langan-Fox, 2006). Empirical studies also show that personality traits are linked to overall health, self-perceived health, and behaviour that may protect or harm health (Korotkov & Hannah, 2004; Ozer & Benet-Martínez, 2006; Strickhouser et al., 2017). Consequently, one would expect personality to be related to sickness absence. However, previous research on the association between personality and sick leave is sparse because studies have mostly concentrated on the association of a single trait, or a few personality traits, with absenteeism, while the relationship between sickness absence and more standardised frameworks for personality, such as the Big Five personality model, has received limited attention (Judge et

al., 1997; Vlasveld et al., 2013). Longitudinal studies on the association of the Big Five personality dimensions and sick leave are particularly sparse, although these studies would provide valuable indications of a potential causal relationship between personality and sickness absence. Such information is especially valuable in this area of research because some studies indicate that onset of health problems, particularly chronic disease, is associated with lasting personality change in adulthood (Jokela et al., 2014). We therefore need more knowledge about whether personality traits indeed are prospectively related to later sickness absence, or whether reverse causal associations may be an alternative explanation.

The Association between Big Five Personality Traits and Sickness Absence

A few previous studies have examined the association between Big Five personality dimensions and sickness absence (Raynik et al., 2020; Störmer & Fahr, 2013; Vlasveld et al., 2013), with only one of them covering register-based sick leave (Blekesaune, 2012). Two of these studies used data from a nationally representative German survey that included a 15-item version of the Big Five Inventory (BFI). The first study used cross-sectional data to examine sickness absence incidence and duration (absences up to 30 days; Störmer & Fahr, 2013), and the second study used longitudinal data to examine sickness absence rates (Raynik et al., 2020). A third Dutch study applied cross-sectional survey data to test the association between personality as measured by the 60-item NEO-Five Factor Inventory and short-term (0–2 weeks) and long-term (> 2 weeks up to six months) sickness absence in a non-representative sample of individuals with psychopathology and healthy controls (Vlasveld et al., 2013). A final Norwegian study comprised cross-sectional survey data from a sample of middle-aged employees combined with register-based data on sickness absence. Blekesaune (2012) examined the association between personality assessed by a 20-item version of the BFI and physician-certified sickness absence

rates after the survey. We will elaborate on the findings of these studies trait by trait below. Note that our following predictions about how personality is related to sickness absence were not pre-registered.

The personality trait of neuroticism, defined as the disposition to experience negative emotions such as anxiety, sadness, irritability and nervousness (Benet-Martínez & John, 1998), may be of particular importance for sickness absence. One may expect an association between neuroticism and sickness absence because high neuroticism is related to poorer physical and mental health and functioning, and poorer stress-coping strategies (Goodwin & Friedman, 2006; Strickhouser et al., 2017), which may increase the risk for sickness absence. Also, high neuroticism is associated with negative health behaviour such as smoking, alcohol and substance use (Malouff et al., 2007; Terracciano et al., 2008). Patterns could also be driven by elevated symptom perception as neurotic individuals tend to worry more about their health (Vollrath et al., 1999), over-report symptoms (Feldman et al., 1999) and see physicians more often (Korotkov & Hannah, 2004). A previous study found rather large positive effects of neuroticism on short- and long-term sickness absence in healthy workers (e.g., OR: 2.15 [1.31–3.52], $p = .002$ for long-term sick leave; Vlasveld et al., 2013). Similar results were found in other studies with large to medium sized associations between neuroticism and sickness absence (Blekesaune, 2012; Raynik et al., 2020; Störmer & Fahr, 2013). We therefore hypothesise that neuroticism is related to higher risk of sickness absence.

Extraverts are characterised as active and energetic, dominant, friendly and outgoing, expressive and experiencing positive emotions (Benet-Martínez & John, 1998). Extraversion entails aspects that lead to conflicting predictions regarding sick leave. On the one hand, this trait has been linked to engagement in health-promoting behaviours (e.g., exercise and healthy diet)

and good self-perceived health (Booth-Kewley & Vickers, 1994; Goodwin & Engström, 2002).
On this basis, one would predict that extraverts might be less absent from work than others. On
the other hand, extraversion and sub-facets such as excitement seeking are positively associated
with substance use and risk taking in some studies (Booth-Kewley & Vickers, 1994; Terracciano
et al., 2008). The link to risky health behaviours could suggest that extraversion positively
predicts sickness absence. Indeed, most studies find that extraversion positively predicts
absenteeism (Judge et al., 1997; Darviri & Woods, 2006; Furnham & Bramwell, 2006). However,
in one of the studies focusing on sickness absence, extraversion has been negatively related to
sickness absence with small sized effects, possibly because extraverts are more likely to cope
with work stressors by expressing their concerns than by avoidance coping in the form of
sickness absence (Vlasveld et al., 2013). The other identified studies on personality and sickness
absence did not find any association with extraversion (Blekesaune, 2012; Raynik et al., 2020;
Störmer & Fahr, 2013). Given the mixed findings in the field, it is somewhat unclear how
extraversion and sickness absence are related.

Conscientious individuals are described as being organised, thorough, self-disciplined
and reliable, and cherish obligations to others, which promotes task- and goal-directed behaviour
(Benet-Martínez & John, 1998). Possibly due to their disciplined nature, conscientious
individuals tend to report less risk-taking behaviour (Vollrath et al., 1999), less drug and alcohol
use (Malouff et al., 2007; Terracciano et al., 2008) and more positive health behaviours than
others (Armon & Toker, 2013; Kern & Friedmann, 2011). Also, conscientiousness is linked to
better self-perceived health and a lower likelihood of developing physical and mental illness
(Goodwin & Engström, 2002; Goodwin & Friedman, 2006). In line with these notions, several
studies have shown that conscientiousness is negatively related to absenteeism (Judge et al.,

1997; Sawyerr et al., 2009), and medium effect sizes related to reduced sickness absence

incidence (Störmer & Fahr, 2013), and reduced risk of short- and long-term sickness absence

(Vlasveld et al., 2013). Although two studies did not find a correlation between

conscientiousness and sickness absence (Blekesaune, 2012; Raynik et al., 2020), we nevertheless

hypothesise that conscientiousness is negatively associated with sickness absence.

Agreeableness refers to being prosocially oriented by, for instance, displaying altruism,

cooperativeness, tolerance, trust and modesty (Benet-Martínez & John, 1998). This trait can lead

to good social relationships and the positive health effects thereof, but can also compromise

health if efforts to harmonise with the surroundings consistently lead to self-sacrifice (Kern &

Friedman, 2011). In earlier studies, agreeableness has been associated with positive health

behaviour and good self-reported health, low alcohol involvement and low risk-taking behaviour

(Booth-Kewley & Vickers, 1994; Goodwin & Engström, 2002; Malouff et al., 2007; Terracciano

et al., 2008). In line with this research, two studies show that agreeableness is related to less risk

of sickness absence in general (Störmer & Fahr, 2013) and less risk of short-term sickness

absence (Vlasveld et al., 2013). However, the effect sizes were small, and two other studies did

not establish this association (Blekeseaune, 2012; Raynik et al., 2020). Still, on this basis we

hypothesise that agreeableness is negatively related to the risk of sick leave.

Openness describes the breadth and complexity of the individual's mental and

experiential capability and is associated with being creative and unconventional (Benet-Martínez

& John, 1998; Terracciano et al., 2008). Individuals high in openness have reported higher

likelihood of negative and risky health behaviour such as drinking, smoking, driving under the

influence and illegal drug use (Booth-Kewley & Vickers, 1994; Terracciano et al., 2008). These

associations could translate into an increased risk of sickness absence not only from a direct

effect on health but possibly also indirectly through negatively affecting job commitment. Still, some studies report that individuals high in openness tend to have a positive health perception (Goodwin & Engström, 2002) and that openness is protective to all-cause mortality (Ferguson & Bibby, 2012). We identified only one study that showed a significant association between openness and sickness absence. Vlasveld and colleagues (2013) found that openness negatively predicted long sickness absence spells (> 2 weeks; medium effect size), but not short spells. The other studies that have examined personality dimensions and sick leave did not find an association with openness (Blekesaune, 2012; Raynik et al., 2020; Störmer & Fahr, 2013). Due to the sparse research on openness, it remains uncertain how openness and sickness absence are related.

In the present study, we additionally control for several factors that are linked to sickness absence. Health is considered a main driver of sickness absence because illness and morbidity are typically requirements for sickness absence and is shown to predict sick leave, particularly spells lasting longer than a week (Ferrie et al., 2009; Marmot et al., 1995). We therefore account for mental and somatic health problems. We also control for cigarette smoking and alcohol consumption because such risk health behaviours are associated with sickness absence (Allebeck Mastekaasa, 2004b; Devaux & Sassi, 2015).

We include gender because women are consistently overrepresented in sickness absence. For example, pooled data over a 10-year period from 17 European countries show that sickness absence among women was on average 30% higher than among men (Mastekaasa & Melsom, 2014). Such gender difference in sickness absence can only to some degree be explained by higher rates of mental and somatic health problems among women than men (Laaksonen et al., 2008; Mastekaasa, 2016), whereas other factors such as work-related psychosocial factors (e.g.,

emotional work and effort-payment imbalance) have also been shown to have some significance (Sterud, 2014). We also control for age due to the positive association with particularly long-term sickness absence. Likewise, we include socio-economic status (education, income) that is negatively correlated with sickness absence (Allebeck & Mastekaasa, 2004b; Markussen et al., 2011). Because we know that the work and family situations may be important influences in sickness absence, we additionally include measures on this. We take type of occupation and job satisfaction into consideration because work tasks associated with manual work and a poor psychosocial work environment seem to entail increased risk of sickness absence (Kok et al., 2017; Laaksonen et al., 2010; Sterud, 2014). Although findings are somewhat inconsistent, we also control for having a partner and younger care-dependent children, because it has been shown to correlate with sickness absence in some studies (Allebeck & Mastekaasa, 2004b; Mastekaasa, 2013). Besides, the previously identified study on personality dimensions and register-based sickness absence did not consider work and family factors (Blekesaune, 2012).

Factors that may Moderate the Personality-Sickness Absence Association

A further aim of this study is to examine whether associations between personality and sickness absence are moderated by health, key socio-demographics and work-related factors. Somatic and mental health measures, substance use, gender, age, type of occupation and job satisfaction cover such factors in our study.

Health is related to sick leave and the strength of personality associations with sick leave may depend on the individual's health status. More specifically, the association between personality and sick leave may be weaker for employees that have physical or mental health problems, because adverse health conditions may lead to sick leave for most employees, largely independent of their personality dispositions.

Concerning key socio-demographics, it is widely established that women generally have higher rates of sickness absence than men do. One mechanism that has been proposed to explain the gender gap in sickness absence is that women and men differ in illness behaviour (Mastekaasa, 2016), and women are to a greater degree than men aware of their health and seek medical attention more often (Oksuzyan et al., 2008). Women also score higher on neuroticism, which is associated with health worries (Schmitt et al., 2008). The relationship between neuroticism and sickness absence may thus differ for men and women. Two studies examining this issue have provided mixed findings, where one study showed that neuroticism predicted higher rates of sickness absence in women, but not in men (Blekesaune, 2012), whereas the other study found that neuroticism only positively predicted sickness absence duration in men (Störmer & Fahr, 2013). The few and conflicting findings call for more studies to examine potential complex associations between gender and personality in sickness absence.

Regarding age, while there has been extensive research on its relation to sickness absence (Markussen et al., 2011), there is less research on age as a moderator of sickness absence predictors. It is possible, for example, that high neuroticism has a stronger positive association to sickness absence for younger workers, because they generally have less work experience and routine than older workers and may therefore be more likely to seek sickness absence when symptoms of ill health arise, or novel job tasks are overwhelming. Another possibility is that different generations of workers are subject to different norms for when sickness absence is acceptable (Markussen et al., 2011), which in turn could yield a stronger negative effect of high conscientiousness on sickness absence in younger generations that may have a more lenient threshold for when sickness absence is necessary. It is also possible that personality dimensions generally have greater latitude in younger workers' assessments of whether sick leave is needed

than in older workers because they overall have less severe health problems that clearly require sickness absence. Accordingly, we hypothesise that the relationship between personality and sickness absence depend on employee age.

Heavy manual occupations are suggested to be a risk factor for sickness absence (Laaksonen et al., 2010), but whether personality predicts sickness absence differently depending on type of occupation has hardly been explored. One study found that extraversion was positively correlated with length of sickness absence among technicians, whereas for service workers, extraversion was negatively and openness was positively associated with absence duration (Störmer & Fahr, 2013). In this study, we hypothesise that personality might have a weaker association with sickness absence for workers in physically demanding occupations compared to office-based occupations, because physically demanding occupations typically involve work tasks that are less feasible with the presence of health problems and thereby provide less individual evaluation of whether sick leave is needed.

Job satisfaction and support is associated with lower likelihood of long-term sickness absence (Kok et al., 2017; Laaksonen et al., 2010), but whether such work circumstances affect the impact of personality on sickness absence has been less addressed. The association between, for example, neuroticism and sickness absence might be stronger when job satisfaction is low because those high in neuroticism may be more heavily influenced by discontent in the job, thereby leading to sickness absence, whereas those low in neuroticism may cope more robustly with a poor psychosocial work environment. Similarly, when job satisfaction is high, those both high and low in conscientiousness may be more likely to attend work, but when job satisfaction is low, high conscientiousness may have a stronger negative relationship with sickness absence.

Thus, we hypothesise that job satisfaction might moderate the relationship between personality and sickness absence.

The Present Study

To sum up, research on personality dimensions predicting sickness absence is limited and results are mixed, but the few existing studies seem to agree that personality is an under-researched and promising field for studying the dispositional basis of work absence. However, with one exception, previous studies have relied on self-reported sickness absence, which is prone to underreporting (Thorsen et al., 2018). There is also a dearth of studies testing the assumption that personality can predict absenteeism over time spans greater than a year (Harrison & Martocchio, 1998). The present study therefore adds to previous research by examining the prospective association between personality and sickness absence over a four-year period. Using register-based, physician-certified sickness absence, the present study is also one of the first to test whether personality dimensions predict longer absences that are gatekept by the physician and thus considered more closely tied to health issues than self-certified absence. Based on previous work, we hypothesise that neuroticism is associated with a higher risk of sickness absence, and that conscientiousness and agreeableness are associated with a lower risk. For extraversion and openness, due to mixed and sparse findings, we did not state any hypothesis concerning the association to sickness absence. We further hypothesise that the associations between personality and sickness absence is moderated by the employee's health, age and gender, and depend on the type of occupation and job satisfaction of the employee.

Methods

Study Procedure and Participants

We used cross-sectional data from the second wave of The Norwegian Life-Course, Ageing and Generation study (NorLAG2; NorLAG, 2014). NorLAG2 is a large-scale survey comprising a nationally representative sample of respondents aged 18–79 (N = 14,884). In collaboration with Norwegian Social Research, Statistics Norway performed the data collection in 2007 from computer-assisted telephone interviews, self-completion questionnaires and administrative registers. Informed consent was obtained for both participation in the study and the link to register data. The NorLAG study was approved by the Data Protection Officer for Research at Statistics Norway and the Norwegian Centre for Research Data.

The initial telephone interview had a response rate of 60%, and 73% of the interviewees completed the subsequent questionnaire (overall response rate of 44%). Non-response bias for the telephone interview was generally small, but non-response was somewhat higher among the youngest age group (18–29 years) and among persons with lower degree of education. Moreover, of those who were interviewed, young age, being male and low education were related to a somewhat higher risk of not completing the questionnaire. The net sample for the self-completion questionnaire thus showed that women were overrepresented by four percentage points, while the two youngest age groups were somewhat underrepresented (18–29 years by 4.6 percentage points and 30–39 years by 1.4 percentage points) and those with lower degree of education were underrepresented by just above eight percentage points (see Bjørshol et al., 2010 and Slagsvold et al., 2012 for more study details and response rates in NorLAG).

The requirements for receiving sickness benefit in Norway include being less than 70 years of age, being unable to work due to functional impairment from sickness or injury, having worked continuously for a minimum of four weeks, and earning at least half of the yearly public

pension base rate of the National Insurance Scheme (1x the average public pension base rate amounted to 65,505 NOK in 2007). Sickness benefit is maximally received for one continuous year, and a one-year sickness-benefit period may enable disability pension. For workers aged 67–69 years, however, sickness benefit requirements and maximal length differ from those of younger workers. Consequently, workers who were 67 years or older in 2011 (the last year with data on sickness absence), who retired with a disability pension, old-age pension or early retirement pension within 2011, were omitted from the study sample. Self-employed respondents were also removed because they generally have less generous sickness-benefit schemes than other workers.

To further ensure a sample that represented workers that were entitled to sickness benefit, we set three selection criteria: (1) gainful employment during the interview, (2) normally working at least 15 hours per week, and (3) an annual salary a minimum 50% of the public pension base rate in the interview year and the four-year study period after the interview (2007–2011). Finally, the sample was restricted to those who had completed the questionnaire where personality was measured. The present study sample thus comprised 5,017 respondents between 18–62 years at the time of the interview.

Measures

Sickness absence

Data on sickness absence were derived from Statistics Norway's Historical-Event Database and linked to the survey data. The data provide information on whether and for how long the employees received sickness benefit for physician-certified sickness absence through the Norwegian Labour and Welfare Administration (NAV). The employer normally covers the employee's sick pay for the first 16 calendar days, while NAV covers sickness benefit from the

17th day of sick leave. Hence, we do not have records concerning shorter sick leaves < 17 days

that are physician- or self-certified and are thereby not able to identify such shorter spells.

Sickness absence length was recorded as the sum of sickness benefit days within each year for

the years 2007 to 2011, coded as number of workweeks with sickness benefit (1 week = 5

working days). For analysis purposes, we calculated sick leave as the sum of absence weeks over

the four years after the interview as the outcome variable (2008–2011; M: 8.72; SD: 16.95; Min:

0; Max: 121).

Personality

Personality was measured by a 20-item Norwegian short version of the Big Five

Inventory (BFI; John & Srivastava, 1999). Both the original BFI and the short version have

shown favourable psychometric properties and good reliability (Engvik & Føllesdal, 2005; John

& Srivastava, 1999). The BFI has also demonstrated good cross-cultural validity and convergent

validity with other well-known five-factor measures (Engvik & Føllesdal, 2005; John &

Srivastava, 1999).

Four items each measured the five personality dimensions. We used McDonald's Omega

Total (ω_t) to assess reliability, because this measure is recommended to be used instead of

Cronbach's alpha for unidimensional scales when tau equivalence is not assumed (McNeish,

2018). Reliability estimates were: openness ($\omega_t = .70$), conscientiousness ($\omega_t = .64$), extraversion

($\omega_t = .85$), agreeableness ($\omega_t = .67$) and neuroticism ($\omega_t = .73$). The items consist of short

characteristics that are rated on a seven-point scale from *fits poorly* (1) to *fits well* (7) based on

how these descriptions apply to the typical state of the respondent. Mean scores for each

personality trait were computed. Although some of the values of the composite reliability are

modest, they resemble those obtained with other short measures of broad personality traits (Lang

et al., 2011). The BFI items were originally not constructed to measure personality on the facet level. Yet, to illustrate content heterogeneity, the four items measuring conscientiousness, the trait with the lowest reliability, have been shown to cover diverse aspects of conscientiousness related to facets of Order (tends to be disorganised; can be somewhat careless) and Self-discipline (makes plans and follows through with them) according to the BFI facet scales that were developed later (Soto & John, 2009). A full overview of the BFI-20 scale items used in this study is available as online supplementary material S1 at https://osf.io/5823a/.

Health-related factors

We controlled for several health aspects that are likely to explain a substantial part of sickness absence. Two items measured physical health and functioning by phone interview. The first item assessed whether the respondent has any long-term disease, chronic health problem or permanent disability. The second item assessed whether the respondent is limited in daily tasks due to ill health or disability. Both items scored dichotomously with 0 = no and 1 = yes.

We measured mental health using the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff, 1977). The scale consists of 20 questionnaire items that the respondents rated based on how they felt or behaved during the past week (e.g., "I was bothered by things that usually don't bother me", "I felt that everything I did was an effort"). Response categories ranged from *rarely or none of the time* (1), *some or a little of the time* (2), *occasionally or a moderate amount of time* (3) to *most or all of the time* (4). The scale demonstrated good reliability ($\omega_t = .89$) and was dichotomised to scores below 16 (0) and scores of 16 or higher (1), which indicates being at risk for clinical depression (Weissman et al., 1977). The CES-D scale is commonly used to quantify depression and the scale's high reliability and validity is documented in numerous survey and population studies (Cosco et al., 2017). Note that the scale contains

some items that overlap with items of the neuroticism trait and this is also reflected in the

correlation between the two ($r = .38$). Notably depression items such as "I felt sad", "I felt like I

could not shake off the blues …", "I felt depressed" and "I felt fearful" were similar to

neuroticism traits of "feeling depressed, blue", "worries a lot" and "gets nervous easily". The

time aspect and concept of the two scales are nevertheless different since CES-D measured

symptoms the last week, while personality aimed to capture the typical state of the respondent.

We also assessed substance use through two measures: whether the respondent smoked

cigarettes on a daily basis (no = 0; yes = 1) and whether the respondent had a risky level of

alcohol consumption defined as a weekly alcohol intake that exceed the recommendation of the

UK Department of Health (2016) to consume a maximum of 14 standard units of alcohol per

week (no = 0; yes = 1).

Occupational type

Data on occupation were derived from the telephone interview and were classified in

broad occupational groups according to the International Standard Classification of Occupations

(ISCO-08). Based on this information we divided the respondents in two occupational categories.

The first category, coded '0', comprised individuals with typically office-based and non-manual

jobs (managers, professionals, technicians and associate professionals, clerical support workers).

The second category, coded '1', consisted of occupations that are considered to involve manual

and physically demanding job tasks (service and sales workers, skilled agricultural, forestry and

fishery workers, craft and related trades workers, plant and machine operators and assemblers,

elementary occupations).

Job satisfaction

Five items from the telephone interview assessed job satisfaction. These items were inspired by other large surveys where work has been an important study domain, such as the Midlife in the United States study and the Norwegian Living Conditions Survey on Working Environment. The items were introduced by the sentence, "To what extent do you experience in your work that …", with the following items: "the management appreciates your work", "colleagues ask for your advice", "you have the opportunity to learn new things", "you have self-determination in your job" and "you have monotonous work tasks". The four response categories ranged from *to large extent* (1), *to some extent* (2), *to little extent* (3) to *not at all* (4). We combined the items into a mean score of overall job satisfaction so that a high score indicated high job satisfaction. The scale had a reliability of $\omega_t = .65$.

Socio-demographic data

Socio-demographic variables included respondents' age at the time of the interview, gender (male = 0; female = 1), and employment income in the interview year in 100,000 Norwegian kroner (NOK; about 10,000 USD). Additionally, respondents' level of education in the interview year was classified as basic education (0), comprising completed upper secondary school or lower, and as higher education (1), which included university or college education of minimum one year. Having care dependent children was operationalised as having children below 11 years of age in the household (no = 0; yes = 1), while living with a partner at the time of the interview also was dichotomously scored (no = 0; yes = 1).

Statistical Analyses

A series of negative binomial regression analyses using Stata v15.1 (StataCorp., 2017), were performed to examine the prospective association between personality and sickness absence weeks. This type of analysis is particularly suitable for count data. We apply the most

common variant, the negative binomial 2, which uses a quadratic variance function of the mean (see Cameron & Trivedi, 2001 for more details).

In a first step, personality dimensions were included one by one as predictors of sickness absence in univariate models. In a second step, all personality dimensions, age and gender were included simultaneously as predictors to assess the relative importance of personality to sick leave. In a third step, all predictor variables were added simultaneously, including personality, health factors, occupational type, job satisfaction and sociodemographics (full model). To examine the potentially confounding effect of prior sick leave spells, the full model analysis was rerun in a sample where respondents who had sick leave in the interview year were excluded. Lastly, interaction terms were computed between personality traits and the potential moderators (age, gender, health and work factors) and included one by one in series of full regression models (i.e., models that comprised all study variables).

We reported Incidence Rate Ratios (IRR) as measures of association, 95% confidence intervals for IRR and p-values with a significance level that was set to $p < .01$. IRR provide information about the relative rate of sickness absence weeks by comparing the estimated rate of sickness absence weeks at one level of the predictor variable with the estimated incidence rate when the predictor has increased by one unit. All continuous predictor variables were standardised for the analyses; IRR for continuous predictors can therefore be interpreted as the ratio of estimated incidence rates for one standard deviation change in the predictor variable.

Sample weights provided by the NorLAG study were used as probability weight for single-stage design in Stata to adjust estimates and standard errors for the biased survey participation (see Bjørshol et al., 2010 for more information about survey weight calculation in NorLAG). As fit indices for negative binomial regression models cannot be estimated when

adjusting for survey weights, we reported model fit for analyses without adjustments. All

analyses were also conducted without survey weights to check the robustness of the results. The

data code and analysis script for the analyses are openly accessible as online supplementary

material S3 at https://osf.io/5823a/.

<div align="center">**Results**</div>

Descriptive Statistics

      The final sample consisted of 5,017 gainfully employed respondents with an average age

of 41.8 years ($SD = 10.3$), and 54.7% were women ($n = 2,746$). In all, 47.1% had college or

university education and 75.8% were living with a partner. Furthermore, 43.9% ($n = 2,200$) of

the sample had at least one physician-certified sickness-absence spell (> 16 days) in the four

years following the interview.

      Table 1 provides descriptive statistics for the total study sample and for those with and

those without sick leave during the study period. Concerning personality, particularly

neuroticism showed elevated levels among the group that had sick leave. Moreover, also

agreeableness and extraversion scores were somewhat higher among this group compared to

those who did not have sick leave. Somatic and mental health problems were more prevalent in

the group that had sick leave. Daily smoking was related to a higher risk for sick leave, whereas

high levels of alcohol consumption were slightly less prevalent among individuals with sick

leave compared to those who did not have sick leave. Regarding sociodemographics, being a

woman, low income, no higher education, and working in manual occupations were related to

more sickness absence. Finally, job satisfaction was lower among those with sickness absence.

      Bivariate correlations showed small to moderate correlations within Big Five personality

traits, except for between openness and conscientiousness ($p > .01$), and with age, gender and job

satisfaction. Neuroticism was positively correlated with all health status variables, whereas openness was positively correlated with risky alcohol use, but did not correlate with any of the health status variables (see online supplementary material S2 at https://osf.io/5823a/).

The Prospective Associations between Personality Traits and Sickness Absence

Our outcome of sick leave weeks indicated overdispersion as the mean of the outcome for the sample (8.72) was considerably smaller than the variance (287.46). Moreover, likelihood-ratio tests for all models confirmed that the dispersion parameter alpha significantly differed from 0, suggesting that a negative binomial model was preferable to a Poisson model for the count data (i.e., number of weeks of sick leave) used in this study.

In a first set of analyses, univariate models were run to examine the association between each personality trait and sick leave separately (see first half of Table 2). The results showed that with one standard deviation increase in neuroticism the expected rate of sickness absence weeks increased by 26% (IRR: 1.26, 95% CI: 1.19–1.34, $p < .001$). The other four remaining personality traits, extraversion, openness, agreeableness and conscientiousness, were not predictive of sick leave in these unadjusted models ($p > .01$).

Second, we regressed sickness absence on all personality dimensions along with age and gender simultaneously. The results (see second half of Table 2) showed that the previously reported association with neuroticism held in this analysis. We further noticed that extraversion showed a tendency of being positively related to sick leave with an IRR of 1.10; however, this association was not statistically significant (IRR: 1.10, 95% CI: 1.02–1.19, $p = .015$). The other three remaining personality traits also continued to not be predictive of sick leave ($p > .01$). Higher age and being female were related to higher rates of sickness absence (IRR_{age}: 1.19, 95% CI: 1.10–1.28, $p < .001$; IRR_{female}: 1.98, 95% CI: 1.70–2.31, $p < .001$).

Third, all study variables were included in a full model to adjust for all risk factors of sick leave simultaneously (see first part of Table 3). The association between neuroticism and sickness absence remained significant in this model. The results further suggested that the estimated rate of sickness absence weeks increased statistically significantly by 14% with every standard deviation increase in extraversion (IRR: 1.14, 95% CI: 1.05–1.22, p = .002). Moreover, higher income was associated with a significant decrease in the rate of sick leave weeks, whereas having at least one long-term health problem and having depressive symptoms were related to a significant increase in the rate of sick leave weeks (p < .01).

Finally, the full model was rerun with a sample where respondents with previous sick leave (n = 767) were excluded. In this model, of all personality traits, only extraversion significantly predicted sick leave. Excluding respondents with previous sick leave did not substantially change the associations between the remaining covariates and sick leave other than being at risk of depression, which was no longer significantly related to sick leave (p = .102; see last part of Table 3).

We conducted additional single-item analyses to examine how each of the 20 personality items individually was associated with sick leave in the final, fully adjusted models where respondents with sick leave in 2007 were excluded. The results showed that one of the four extraversion items were significantly related to sick leave (p <. 01), whereas one additional item showed a p-value of p < .05 (see online material S4 for these supplementary results at https://osf.io/5823a/).

All analyses were also rerun without survey weights, which did not change the results substantially, thus indicating robustness of the results.

Moderator Analyses

We tested for moderator effects of all personality dimensions with gender, age, health measures, substance use, type of occupation and job satisfaction where each product term was included in separate full model analyses (including as such main effects from all predictors used in the study). The results yielded two significant moderator effects.

First, we found an interaction effect of age and openness on sick leave (IRR_{age}: 1.23, 95% CI: 1.13–1.33, $p < .001$; $IRR_{openness}$: 1.02, 95% CI: 0.95–1.10, $p = .534$; $IRR_{age*openness}$: 1.12, 95% CI: 1.05–1.20, $p = .001$). A graphical illustration of the interaction effect is provided in Figure 1. The figure suggests that for the oldest individuals (62 years old), higher scores on openness were associated with an increased estimated rate of sick leave weeks. In contrast, for the youngest part of the sample, those that were 18 years old, high scores on openness were associated with a decreased rate of sick leave weeks.

Second, type of occupation significantly moderated the association of agreeableness with sickness absence ($IRR_{occupation}$: 1.32, 95% CI: 1.06–1.64, $p = .012$; $IRR_{agreeableness}$: 1.14, 95% CI: 1.03–1.26, $p = .013$; $IRR_{occupation*agreeableness}$: 0.81, 95% CI: 0.70–0.94, $p = .005$). Figure 2 illustrates this interaction effect by showing that for individuals working in primarily manual occupations, higher scores on agreeableness corresponded to a decrease in the estimated rate of weeks of sick leave. For individuals working in primarily non-manual occupations, however, higher scores on agreeableness tended to be related to an increase in the estimated rate of sick leave weeks.

Discussion

The main purpose of this study was to examine whether personality is associated with physician-certified sickness absence. Overall, the results suggested that after controlling for a variety of relevant covariates and excluding respondents with prior spells of sick leave, high

levels of extraversion were prospectively related to an increased risk of sick leave. Furthermore, neuroticism was positively associated with sick leave even with control for covariates; however, the association diminished when excluding participants with prior spells of sick leave. Two interaction effects showed further the complex relationships between personality, age and work factors, and sick leave.

The Prospective Associations between Personality Traits and Sickness Absence

Neuroticism was related to an increased risk of future sick leave, also when health, family and work factors were included in the analyses. These findings are in line with studies that found cross-sectional (Störmer & Fahr, 2013; Valsveld et al., 2013) and longitudinal (Blekesaune, 2012; Raynik et al., 2020) associations between neuroticism and sick leave with control for health factors. However, new in our study is the finding that the prospective association between neuroticism and sickness absence diminished into insignificance when removing respondents that had sick leave in the interview year. This result may thus suggest that the neuroticism-sickness absence association does not necessarily originate in causal mechanisms where neuroticism influences sickness absence, but that associations may be explained by confounding or reverse causal directionality. Such a notion is in accordance with research showing that major negative life events, for example the onset of chronic disease, and associated mental distress and deterioration in life quality predict lasting increases in neuroticism (Jeronimus et al., 2014; Jokela et al., 2014).

The positive relationship between extraversion and sick leave corresponds with previous studies on extraversion and absenteeism (Furnham & Bramwell, 2006; Judge et al., 1997), but conflicts with the results of Vlasveld et al. (2013), who found a negative effect of extraversion on both shorter and longer sick leave spells (> 2 weeks). This latter study explains its findings in

terms of extraverts possibly being less likely to deal with, for example, work stressors by means of avoidance coping through sick leave. In contrast, the positive associations between extraversion and absenteeism in other studies were suggested to originate from extraverts' tendency to prioritise leisure and social obligations outside the work sphere, especially when work tasks are mundane (Furnham & Bramwell, 2006; Judge et al., 1997). This explanation, though, seems less intuitive for predicting longer-term physician-certified sick leave. Possibly, the tendency of extraverts to take risks and seek excitement may increase the risk of long-term sick leave, as extraverts are more prone to substance use and accidents (Booth-Kewley & Vickers; 1994; Terracciano et al., 2008). Alternatively, in line with the concept of presenteeism, individuals low in extraversion may be less likely to seek sick leave even when being ill. More specifically, by having a tendency to be reserved and inhibited, these people may prefer to continue with their normal work activity in order not to attract attention and have to disclose themselves to the doctor and colleagues. Also, people with low levels of extraversion may refrain from going to the doctor and approaching colleagues and superiors for sick leave because of lower levels of self-worth and social skills compared to extraverted people (Ozer & Benet-Martínez, 2006; Robins et al., 2001). The present study did not provide data that allowed to test for these potential mechanisms of the association between extraversion and risk of sick leave. Future longitudinal studies with a more comprehensive assessment of extraversion, including facets such as excitement seeking and assertiveness, may provide the opportunity to test such mechanisms by disentangling the effect of specific facets of extraversion on sick leave.

The lack of any main effect of conscientiousness in our study was surprising, given earlier findings that conscientiousness is negatively related to work absence and the well-documented health- and task-directed nature of conscientious individuals. Nevertheless, the other

previous study on personality and register-based sickness absence also did not find an effect of conscientiousness (Blekesaune, 2012); neither did a study based on longitudinal survey data (Raynik et al., 2020). This could indicate that the potentially buffering effect of conscientiousness on work absence primarily appears for absenteeism and more short-term sick leave. In fact, conscientiousness has been positively linked to emotional exhaustion (Armon et al., 2012). Thus, although conscientious individuals are committed and motivated in their work, which would generally yield negative associations to work absence, these characteristics might entail aspects that over time could predispose them for longer absences due to burnout as well (Armon et al., 2012; Woods et al., 2013).

Less surprising, however, was the non-significant main effect of openness on sickness absence, as it is in accordance with most previous studies and thereby supports the notion that this personality dimension does not appear to be an overall decisive predictor for work absence. Still, a moderator effect of openness with age on sickness absence was found, indicating that openness increased the risk of sick leave for older employees compared to younger employees. Possibly, for younger employees, openness may promote adaptation to shifting work demands and integration in new workplaces which are of importance early in an occupational career. In contrast, high levels of openness may impede job performances and increase risk of sick leaves among older employees when extensive experience makes work less challenging and more monotonous.

For agreeableness, the lack of a main effect did not support our hypothesis of a negative association with sick leave. Yet, the moderator analyses suggested that agreeableness might have some bearing on sick leave in more intricate manners. The identified moderator effect of agreeableness with type of occupation lends some support to our assumption that personality

may have differential associations with sickness absence when contrasting occupations that are not physically demanding with manual occupations. Perhaps, highly agreeable persons may be less willing to be absent from work in manual occupations because they perceive the additional burden on colleagues due to their own absence to be greater in physically strenuous occupations compared to non-manual occupations. This seemingly complex association between personality, type of occupation and sick leave, may be an interesting area for future research.

Strengths and Limitations

The present study is the first to examine in a nationally representative sample the longitudinal relationship between personality and physician-certified longer-term sick leave using register data on sickness absence. The use of a large, representative survey sample combined with highly reliable register-based data on sickness absence is a major strength. Using register data on sickness absence is advised because self-reported sick leave is prone to recall bias and social desirability (Thorsen et al., 2018). Moreover, several previous studies relied on cross-sectional survey data, thereby providing limited information about the temporal relationship between personality and sick leave, which further clouds causal inference.

However, the study also has limitations. First, the available register data on sickness absence only provided information about spells of sick leave that lasted more than 16 days. Shorter periods of sick leave, including both self- and physician-certified spells were not assessed, and the present study provides no information about how such spells are related to personality. Furthermore, data on sickness absence only provided information about the accumulated number of weeks of sickness absence within a calendar year for each of the four years (2008–2011). It was thus not possible to differentiate between several shorter-term spells of sickness absence and one long-term spell within the year.

We used a short version of a widely applied personality measure. Yet, with four items measuring each trait, the breadth of coverage of this measure is limited, and thus this may also have limited its potential in predicting the outcome. With a more comprehensive instrument, we would be able to capture more nuances and assess narrow personality facets, which may provide more detailed information, in addition to broad traits in predicting sickness absence (Judge et al., 1997; Lounsbury et al., 2004). Personality facets or items tend to outperform the broader personality traits in predicting a wide range of behavioural outcomes (Paunonen & Ashton, 2001; Seebooth & Mõttus, 2018). However, studies show that the Big Five seems sufficient for predicting work-related behehaviour (Judge et al., 1997; Woods et al., 2013). Still, discrepancies in findings between studies may be the result of different representations of items of personality traits used. Also, a more comprehensive measure of personality would provide more information about different mechanisms that can operate at lower trait levels and disentangle whether facet or item level associations with sickness absence go in different directions.

We chose a rather conservative level of significance with $p < .01$; however, we acknowledge that interaction effects would be considered not significant with a more strict correction for multiple comparisons when conducting moderation analyses. The two identified interaction effects should therefore be considered preliminary.

Finally, the generalisability of the study results may also be limited in other ways. Although the study sample was stratified to be nationally representative, the respondents were overall higher educated and healthier than the general population (Slagsvold et al., 2012), which could lead to somewhat biased study results. Nevertheless, the use of survey weights did not significantly change the results compared with unweighted analyses, thus indicating that such biases in the sample do not appear to be a major concern. The findings may further not be

generalisable to other countries that have less generous sickness benefit schemes, a less inclusive working life, higher unemployment, or other labour market conditions that are different from the Norwegian context and that may affect the sickness absence rate.

Conclusions

Previous studies on personality and sickness absence have concentrated on shorter periods of self-assessed absence, but the societal and individual costs are greater for longer-term sickness absence. The present study is one of the first to show that, when taking long-term illness, chronic disease and previous sick leave into consideration, high levels of extraversion are associated with an increased risk of future longer-term sickness absence. The association thereby implies that the relationship between extraversion and long-term sickness absence is not only a direct function of health but also seems to rely on other aspects related to this personality trait. In contrast, our study indicates that even though neuroticism is associated with future sick leave, this association may not remain when key confounding factors and previous sick leave incidents are included in the assessment. The causal nature of the association between neuroticism and longer-term sickness is as such unclear and needs further examination.

Findings also indicate that associations between personality predispositions and longer-term sick leave may depend on the type of occupation. These results suggest worthwhile future research and may be of particular interest to employers and practitioners. Future studies may also advance the understanding of personality's role in predicting longer-term sickness absence by studying interactive effects of personality dimensions. From societal and individual perspectives, neither the overuse nor underuse of sick leave is desirable (Alexanderson, 1998). Yet, understanding more of the dynamics of sickness absence, and gaining knowledge on whether personality is also a contributory factor to longer-term sickness absence in general and

potentially for some social groups in particular, can provide practice-relevant knowledge for workplace adaption and return-to-work programmes.

Data Accessibility Statement

Supplementary material, code and analysis scripts for this article is available at https://osf.io/5823a/. Additional survey material and data are available at https://norlag.nsd.no/ and https://doi.org/10.18712/NSD-NSD1461-V1. The NorLAG data are accessible for research purposes from the Norwegian Centre for Research Data for researchers affiliated with a Norwegian research institution. Due to the extensive linkage to Norwegian register data, data are not allowed to be stored outside Norway.

References

Alexanderson, K. (1998). Sickness absence: a review of performed studies with focused on levels of exposures and theories utilized. *Scandinavian Journal of Social Medicine*, *26*(4)*,* 241–249. https://doi.org/10.1177/14034948980260040301

Allebeck, A., & Mastekaasa, A. (2004a). Chapter 3. Causes of sickness absence: Research approaches and explanatory models. *Scandinavian Journal of Public Health*, *32*(63_suppl), 36–43. https://doi.org/10.1080/14034950410021835

Allebeck, A., & Mastekaasa, A. (2004b). Chapter 5. Risk factors for sick leave – general studies. *Scandinavian Journal of Public Health*, *32*(63_suppl), 49–108. https://doi.org/10.1080/14034950410021853

Armon, G., & Toker, S. (2013). The role of personality in predicting repeat participation in periodic health screening. *Journal of Personality*, *81*(5), 452–464. https://doi.org/10.1111/jopy.12021

Armon, G., Shirom, A., & Melamed, S. (2012). The Big Five personality factors as predictors of

changes across time in burnout and its facets. *Journal of Personality*, *80*(2), 403–427.

https://doi.org/10.1111/j.1467-6494.2011.00731.x

Benet-Martínez, V., & John, O. P. (1998). Los Cinco Grandes across cultures and ethnic groups:

Multitrait-multimethod analyses of the Big Five in Spanish and English. *Journal of*

Personality and Social Psychology, *75*(3), 729–750.

https://doi.org/10.1037//0022-3514.75.3.729

Blekesaune, M. (2012). Kan personlighet predikere sykefravær? [Personality and sickness

absence]. *Tidsskrift for velferdsforskning*, *15*(1), 2–10.

Bjørshol, E. H. M., Høstmark, M., & Lagerstrøm, B. (2010). *Dokumentasjonsrapport. Livsløp,*

aldring og kjønn, LOGG 2007. (Notater 2010/19). Statistics Norway.

https://www.ssb.no/a/publikasjoner/pdf/notat_201019/notat_201019.pdf

Booth-Kewley, S., & Vickers, R. R. Jr. (1994). Associations between major domains of

personality and health behavior. *Journal of Personality*, *62*(3), 281–298.

Cameron, A. C., & Trivedi, P. K. (2001). Essentials of count data regression. In B. Baltagi (Ed.),

A companion to theoretical econometrics (pp. 331–348). Blackwell.

Cosco, T, D., Prina, M., Stubbs, B., & Wu, Y. T. (2017). Reliability and validity of the Center for

Epidemiologic Studies Depression Scale in a population-based cohort of middle-aged

U.S. adults. *Journal of Nursing Management*, *25*(3), 476–485.

https://doi.org/10.1891/1061-3749.25.3.476

Darviri, S. V., & Woods, S. A. (2006). Uncertified absence from work and the Big Five: an

examination of absence records and future absence intentions. *Personality and Individual*

Differences, 41(12), 359–369. https://doi.org/10.1016/j.paid.2006.02.003

Demerouti, E., & Bakker, A. B. (2011). The Job Demands-Resources model: Challenges for

future research. *SA Journal of Industrial Psychology*, *37*(2), 1–9.

https://doi.org/10.4102/sajip.v37i2.974

Devaux, M. & Sassi, F. (2015). The labour market impacts of obesity, smoking, alcohol use and

related chronic diseases. *OECD Health Working Papers, No. 86*. OECD Publishing.

https://doi.org/10.1787/5jrqcn5fpv0v-en

Engvik, H., & Føllesdal, H. (2005). The Big Five Inventory på norsk [The Big Five Inventory in

Norwegian]. *Tidsskrift for Norsk psykologforening*, *42*(2), 128–129.

Feldman, P. J., Cohen, S., Doyle, W. J., Skoner, D. P., & Gwaltney, J. M. Jr. (1999). The impact

of personality on the reporting of unfounded symptoms and illness. *Journal of

Personality and Social Psychology*, *77*(2), 370–378.

https://doi.org/10.1037/0022-3514.77.2.370

Ferguson, E., & Bibby, P. A. (2012). Openness to experience and all-cause mortality: a meta-

analysis and r(equivalent) from risk ratios and odd ratios. *British Journal of Health

Psychology*, *17*(1), 85–102. https://doi.org/10.1111/j.2044-8287.2011.02055.x

Ferrie, J. E., Vahtera, J., Kivimäki, M., Westerlund, H., Melchior, M., Alexanderson, K.,

Head, J., Chevalier, A., Leclerc, A., Zins, M., Goldberg, M., & Singh-Manoux, A. (2009).

Diagnosis-specific sickness absence and all-cause mortality in the GAZEL study. *Journal

of Epidemiology and Community Health*, *63*(1), 50–55.

https://doi.org/10.1136/jech.2008.074369

Furnham, A., & Bramwell, M. (2006). Personality factors predict absenteeism in the workplace.

Individual Differences Research, *4*(2), 68–77.

Goodwin, R., & Engström, G. (2002). Personality and the perception of health in the general

population. *Psychological Medicine*, *32*(2), 325–332.

https://doi.org/10.1017/S0033291701005104

Goodwin, R. D., & Friedman, H. S. (2006). Health status and the five-factor personality traits in

a nationally representative sample. *Journal of Health Psychology*, *11*(5), 643–654.

https://doi.org/10.1177/1359105306066610

Grant, S., & Langan-Fox, J. (2006). Occupational stress, coping and strain: the

combined/interactive effect of the Big Five traits. *Personality and Individual Differences*,

41(4), 719–732. https://doi.org/10.1016/j.paid.2006.03.008

Harrison, D. A., & Martocchio, J. J. (1998). Time for absenteeism: a 20-year review of origins,

offshoots, and outcomes. *Journal of Management*, *24*(3), 305–350.

https://doi.org/10.1177/014920639802400303

Henderson, M., Harvey, S. B., Øverland, S., Mykletun, A., & Hotopf, M. (2011). Work and

common psychiatric disorders. *Journal of the Royal Society of Medicine*, *104*(5), 198–

207. https://doi.org/10.1258/jrsm.2011.100231

Henderson, M., Hotopf, M., & Leon, D. A. (2009). Childhood temperament and long-term

sickness absence in adult life. *The British Journal of Psychiatry*, *194*(3), 220–223.

https://doi.org/10.1192/bjp.bp.107.044271

Jeronimus, B. F., Riese, H., Sanderman, R., & Ormel, J. (2014). Mutual reinforcement between

neuroticism and life experience: a five-wave, 16-year study to test reciprocal causation.

Journal of Personality and Social Psychology, *107*(4), 751–764.

https://doi.org/10.1037/a0037009

John, O. P., & Srivastava, S. (1999). The Big Five Trait taxonomy: history, measurement, and

theoretical perspectives. In L. A. Pervin & O. P. John (Eds.), *Handbook of personality: Theory and research* (pp. 102–138). Guilford Press.

Johns, G. (2002). Absenteeism and mental health. In J. C. Thomas & M. Hersen (Eds.), *Handbook of mental health in the workplace* (pp. 437–455). Sage publishing.

Jokela, M., Hakulinen, C., Singh-Manoux, A., & Kivimäki, M. (2014). Personality change associated with chronic diseases: Pooled analysis of four prospective cohort studies. *Psychological Medicine*, *44*, 2629–2640. https://doi.org/10.1017/S0033291714000257

Judge, T. A., Martocchio, J. J., & Thoresen, C. J. (1997). Five-factor model of personality and employee absence. *Journal of Applied Psychology*, *82*(5), 745–755. https://doi.org/10.1037/0021-9010.82.5.745

Kern, M. L., & Friedman, H. S. (2011). Personality and pathways of influence on physical health. *Social and Personality Psychology Compass*, *5*(1), 76–87. https://doi.org/10.1111/j.1751-9004.2010.00331.x

Kok, A. A., Plaisier, I., Smit, J. H., & Penninx, B. W. (2017). The impact of conscientiousness, mastery, and work circumstances on subsequent absenteeism in employees with and without affective disorders. *BMC Psychology*, *5*(10), 1–10. https://doi.org/10.1186/s40359-017-0179-y

Korotkov, D., & Hannah, T. E. (2004). The Five-Factor Model of Personality: Strengths and limitations in predicting health status, sick-role and illness behaviour. *Personality and Individual Differences*, *36*(1), 187–199. https://doi.org/10.1016/S0191-8869(03)00078-3

Lang, F. R., John, D., Lüdtke, O., Schupp, J., & Wagner, G. G. (2011). Short assessment of the Big Five: robust across survey methods except telephone interviewing. *Behavior Research Methods*, *43*(2), 548–567. https://doi.org/10.3758/s13428-011-0066-z

Laaksonen, M., Martikainen, P., Rahkonen, O., & Lahelma, E. (2008). Explanations for gender

differences in sickness absence: Evidence from middle-aged employees from Finland.

Occupational and Environmental Medicine, *65*(5), 325–330.

https://doi.org/10.1136/oem.2007.033910

Laaksonen, M., Pitkäniemi, J., Rahkonen, O., & Lahelma, E. (2010). Work arrangements,

physical working conditions, and psychosocial working conditions as risk factors for

sickness absence: Bayesian analysis of prospective data. *Annals of Epidemiology*, *20*(5),

332–338. https://doi.org/10.1016/j.annepidem.2010.02.004

Lounsbury, J. W., Steel, R. P., Loveland, J. M., & Gibson, L. W. (2004). An investigation of

personality traits in relation to adolescent school absenteeism. *Journal of Youth and

Adolescence*, *33*(5), 457–466. https://doi.org/10.1023/B:JOYO.0000037637.20329.97

Löve, J., Hensing, G., Holmgren, K., & Torén, K. (2013). Explaining the social gradient in

sickness absence: a study of a general working population in Sweden. *BMC Public

Health*, *13*, 545. https://doi.org/10.1186/1471-2458-13-545

Malouff, J. M., Thorsteinsson, E. B., Rooke, S. E., & Schutte, N. S. (2007). Alcohol involvement

and the Five-Factor Model of personality: a meta-analysis. *Journal of Drug Education*,

37(3), 277–294. https://doi.org/10.2190/DE.37.3.d

Markussen, S. (2012). The individual cost of sick leave. *Journal of Population Economics*,

25(4), 1287–1306. https://doi.org/10.1007/s00148-011-0390-8

Markussen, S., Røed, K., Røgeberg, O. J., & Gaure, S. (2011). The anatomy of absenteeism.

Journal of Health Economics, *30*(2), 277–292.

https://doi.org/10.1016/j.jhealeco.2010.12.003

Marmot, M., Feeney, A., Shipley, M., North, F., & Syme, S. L. (1995). Sickness absence as a

measure of health status and functioning: from the UK Whitehall II study. *Journal of*

Epidemiology and Community Health, *49*(2), 124–130.

https://doi.org/10.1136/jech.49.2.124

Mastekaasa, A. (2013). Dependent children and women's sickness absence in the EU countries

and Norway. *European Societies*, *15*(5), 686–706.

https://doi.org/10.1080/14616696.2012.721892

Mastekaasa, A. (2016). Kvinner og sykefravær [Women and sick leave]. *Tidsskrift for*

velferdsforskning, *10*(2), 125–147. https://doi.org/0.18261/issn.2464-3076-2016-02-03

Mastekaasa, A., & Melsom, A. M. (2014). Occupational segregation and gender differences in

sickness absence: Evidence from 17 European countries. *European Sociological Review,*

30(5), 582–594. https://doi.org/10.1093/esr/jcu059

McNeish, D. (2018). Thanks coefficient alpha, we'll take it from here. *Psychological Methods*,

23(3), 412–433. https://doi.org/10.1037/met0000144

NorLAG (2014). *The Norwegian Life-Course, Ageing and Generation Study, Wave 2, file version*

5 (LOGG easy-to-use, 2007/2008). https://doi.org/10.18712/NSD-NSD1461-V1

Oksuzyan, A., Juel, K., Vaupel, J. W., & Christensen, K. (2008). Men: good health and high

mortality. Sex differences in health and aging. *Aging Clinical and Experimental*

Research, *20*(2), 91–102. https://doi.org/10.1007/BF03324754

Ozer, D. J., & Benet-Martínez, V. (2006). Personality and the prediction of consequential

outcomes. *Annual Review of Psychology*, 57, 401–421.

https://doi.org/10.1146/annurev.psych.57.102904.190127

Paunonen, S. V., & Ashton, M. C. (2001). Big Five factors and facets and the prediction of

behavior. *Journal of Personality and Social Psychology*, *81*(3), 524–539.

https://doi.org/10.1037/0022-3514.81.3.524

Radloff, L. S. (1977). The CES-D Scale: a self-report depression scale for research in the general

population. *Applied Psychological Measurement*, *1*(3), 385–401.

Raynik, Y. I., König, H.-H., & Hajek, A. (2020). Personality factors and sick leave days.

Evidence from a nationally representative longitudinal study in Germany. *International

Journal of Environmental Research and Public Health*, *17*(3), 1089.

https://doi.org/10.3390/ijerph17031089

Robins, R. W., Tracy, J. L., Trzesniewski, K., Potter, J., & Gosling, S. D. (2001). Personality

correlates of self-esteem. *Journal of Research in Personality*, *35*(4), 463–482.

https://doi.org/10.1006/jrpe.2001.2324

Salonen, L., Blomgren, J., Laaksonen, M., & Niemelä, M. (2018). Sickness absence as a

predictor of disability retirement in different occupational classes: a register-based study

of a working-age cohort in Finland in 2007–2014. *BMJ Open*, *8*, e020491.

http://dx.doi.org/10.1136/bmjopen-2017-020491

Sawyerr, O. O, Srinivas, S., & Wang, S. (2009). Call center employee personality factors and

service performance. *Journal of Service Marketing*, *23*(5), 301–317.

https://doi.org/10.1108/08876040910973413

Scheil-Adlung, X., & Sandner, L. (2010). Paid sick leave: Incidence, patterns and expenditure in

times of crises. *ESS Paper No. 27*. http://dx.doi.org/10.2139/ssrn.1804816

Schmitt, D. P., Realo, A., Voracek, M., & Allik, J. (2008). Why can't a man be more like a

woman? Sex differences in Big Five personality traits across 55 cultures. *Journal of

Personaliy and Social Psycholoy*, *94*(1), 168–182.

https://doi.org/10.1037/0022-3514.94.1.168

Seebooth, A., & Mõttus, R. (2018). Successful explanations start with accurate descriptions:

   Questionnaire items as personality markers for more accurate predictions. *European*

   Journal of Personality, *32*(3), 186–201. https://doi.org/10.1002/per.2147

Slagsvold, B., Veenstra, M., Daatland, S. O., Hagestad, G., Hansen, T., Herlofson, K., Koløen,

   K., & Solem, P. E. (2012). Life-course, ageing and generations in Norway: the NorLAG

   study. *Norsk Epidemiologi*, *22*(1), 95–102. https://doi.org/10.5324/nje.v22i2.1554

Soto, J. C. (2019). How replicable are links between personality traits and consequential life

   outcomes? The life outcomes of personality replication project. *Psychological Science*,

   30(5), 711–727. https://doi.org/10.1177/0956797619831612

Soto, J. C., & John, O. P. (2009). Ten facet scales for the Big Five Inventory: Convergence with

   NEO PI-R facets, self-peer agreement, and discriminant validity. *Journal of Research in*

   Personality, *43*, 84–90. https://doi.org/10.1016/j.jrp.2008.10.002

StataCorp. (2017). *Stata Statistical Software: Release 15, version 1*. StataCorp LP.

Steers, R. M., & Rhodes, S. R. (1978). Major influences on employee attendance: a process

   model. *Journal of Applied Psychology*, *63*(4), 391–407.

   https://doi.org/10.1037/0021-9010.63.4.391

Sterud, T. (2014). Work-related gender difference in physician-certified sick leave: A prospective

   study of the general working population in Norway. *Scandinavian Journal of Work,*

   Environment and Health, *40*(4), 361–369. https://doi.org/10.5271/sjweh.3427

Strickhouser, J. E., Zell, E., & Krizan, Z. (2017). Does personality predict health and well-being?

   A metasynthesis. *Health Psychology*, *36*(8), 797–810.

   https://doi.org/10.1037/hea0000475

Störmer, S., & Fahr, R. (2013). Individual determinants of work attendance: Evidence on the role

    of personality. *Applied Economics*, *45*(19), 2863–2875.

    https://doi.org/10.1080/00036846.2012.684789

Terracciano, A., Löckenhoff, C. E., Crum, R. M., Bienvenu, O. J., & Costa, P. T. Jr. (2008). Five-

    Factor Model personality profiles of drug users. *BMC Psychiatry*, *8*(22).

    https://doi.org/10.1186/1471-244X-8-22

Thorsen, S. V., Flyvholm, M.-A., & Bültmann, U. (2018). Self-reported or register-based? A

    comparison of sickness absence data among 8,110 public and private employees in

    Denmark. *Scandinavian Journal of Work, Environment and Health*, *44*(6), 631–638.

    https://doi.org/10.5271/sjweh.3747

UK Department of Health (2016). Alcohol Guidelines Review: Report from the Guidelines

    development group to the UK Chief Medical Officers: Department of Health.

    https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_

    data/file/545739/GDG_report-Jan2016.pdf

Vlasveld, M. C., van der Feltz-Cornelis, C. M., Anema, J. R., van Mechelen, W., Beekman, A. T.,

    van Marwijk, H. W. J., & Penninx, B. W. J. H. (2013). The associations between

    personality characteristics and absenteeism: a cross-sectional study in workers with and

    without depressive and anxiety disorders. *Journal of Occupational Rehabilitation*, *23*(3),

    309–317. https://doi.org/10.1007/s10926-012-9406-9

Vollrath, M., Knoch, D., & Cassano, L. (1999). Personality, risky health behavior, and perceived

    susceptibility to health risks. *European Journal of Personality*, *13*(1), 39–50.

Weissman, M. M., Sholomskas, D., Pottenger, M., Prusoff, B. A., & Locke, B. Z. (1977).

Assessing depressive symptoms in five psychiatric populations: A validation study. *American Journal of Epidemiology*, *106*(3), 201–214. https://doi.org/10.1093/oxfordjournals.aje.a112455

Woods, S. A., Lievens, F., De Fruyt, F., & Wille, B. (2013). Personality across working life: the longitudinal and reciprocal influences of personality on work. *Journal of Organizational Behavior*, *34*(S1), S7–S25. https://doi.org/10.1002/job.1863

Table 1

Descriptive Statistics for Respondents with and without Sick Leave and for the Total Study Sample

Variable	Sick leave 2008–2011 (n = 2,200)		No sick leave (n = 2,817)		Total sample (N = 5,017)	
	n (%)	*M (SD)*	*n* (%)	*M (SD)*	*n* (%)	*M (SD)*
Extraversion		4.80 (1.20)		4.71 (1.18)		4.75 (1.19)
Openness		4.41 (1.15)		4.44 (1.13)		4.42 (1.14)
Neuroticism		3.09 (1.12)		2.83 (1.07)		2.94 (1.10)
Agreeableness		5.58 (0.85)		5.47 (0.83)		5.52 (0.84)
Conscientiousness		5.15 (0.90)		5.11 (0.89)		5.13 (0.90)
Age		41.93 (10.29)		41.74 (10.30)		41.82 (10.30)
Female	1,477 (67.1)		1,269 (45.0)		2,746 (54.7)	
Higher education	951 (43.2)		1,411 (50.1)		2,362 (47.1)	
Income in 100,000 NOK		3.68 (1.58)		4.40 (2.63)		4.08 (2.26)
Partner at home	1,653 (75.1)		2,149 (76.3)		3,082 (75.8)	
Children < 11 years at home	765 (34.8)		957 (34.0)		1,722 (34.3)	
Long-term health problems	583 (26.5)		441 (15.7)		1,024 (20.4)	
Health limits daily tasks	214 (9.7)		115 (4.1)		329 (6.6)	
Risk of depression	341 (15.5)		281 (10.0)		622 (12.4)	
Daily smoking	492 (22.4)		468 (16.6)		960 (19.1)	
Risky alcohol use	191 (8.7)		298 (10.6)		489 (9.7)	
Manual occupation	787 (35.8)		789 (29.8)		1,576 (31.4)	
Job satisfaction		3.28 (0.50)		3.37 (0.45)		3.33 (0.47)

Table 2

Results of Negative Binomial Regressions with Sickness Absence in 2008–2011 as Dependent

Variable Using Survey Weights and Standardised Continuous Covariates (n = 4,406)

Variable	IRR	95 % CI	*p*
Personality dimensions included one by one (univariate models)			
Extraversion	1.04	0.98–1.11	.158
Openness	0.99	0.94–1.05	.815
Neuroticism	1.26	1.19–1.34	<.001
Agreeableness	1.06	1.00–1.13	.051
Conscientiousness	1.03	0.97–1.09	.328
All personality dimensions, age and gender included simultaneously			
Extraversion	1.10	1.02–1.19	.015
Openness	1.02	0.95–1.09	.536
Neuroticism	1.27	1.17–1.37	<.001
Agreeableness	1.04	0.96–1.13	.312
Conscientiousness	1.00	0.92–1.08	.973
Age	1.19	1.10–1.28	<.001
Female	1.98	1.70–2.31	<.001

Note. Respondents 18–62 years old.

Table 3

Results of Negative Binomial Regressions with Sickness Absence in 2008–2011 as Dependent Variable Using Survey Weights and

Standardised Continuous Covariates, Full Models

Variable	Sample including those with sick leave in 2007 (n = 3,959)			Sample excluding those with sick leave in 2007 (n = 3,365)		
	IRR	95 % CI	*p*	IRR	95 % CI	*p*
Extraversion	1.14	1.05–1.22	.002	1.15	1.05–1.25	.003
Openness	1.02	0.95–1.10	.558	0.99	0.91–1.08	.820
Neuroticism	1.16	1.07–1.27	<.001	1.09	0.99–1.20	.083
Agreeableness	1.04	0.96–1.13	.307	1.05	0.96–1.16	.267
Conscientiousness	1.08	1.00–1.17	.044	1.07	0.98–1.18	.121
Age	1.23	1.13–1.34	<.001	1.20	1.09–1.32	<.001
Female	1.88	1.55–2.27	<.001	1.97	1.59–2.44	<.001
High education	0.89	0.72–1.10	.289	0.84	0.66–1.07	.152
Income in 100,000 NOK	0.81	0.72–0.90	<.001	0.82	0.73–0.92	.001
Family:						
Partner at home	0.98	0.82–1.17	.803	0.94	0.76–1.16	.577
Children < 11 years at home	1.23	1.04–1.46	.016	1.21	0.99–1.48	.060
Health:						
Long-term health problems	1.54	1.28–1.85	<.001	1.57	1.26–1.95	<.001
Health limiting daily tasks	1.28	0.97–1.70	.083	0.98	0.69–1.37	.884
Risk of depression	1.36	1.10–1.69	.004	1.22	0.96–1.56	.102
Daily smoking	1.06	0.88–1.28	.511	1.02	0.81–1.29	.847
Risky alcohol use	0.97	0.75–1.26	.838	0.92	0.70–1.21	.543
Work:						
Manual occupation	1.32	1.06–1.64	.012	1.31	1.03–1.66	.030
Job satisfaction	0.94	0.88–1.02	.136	0.97	0.89–1.06	.495

Note. All independent variables included simultaneously. Respondents 18–62 years old.

Figure 1

Predictive Margins of Sick Leave Weeks as a Function of Openness and Age
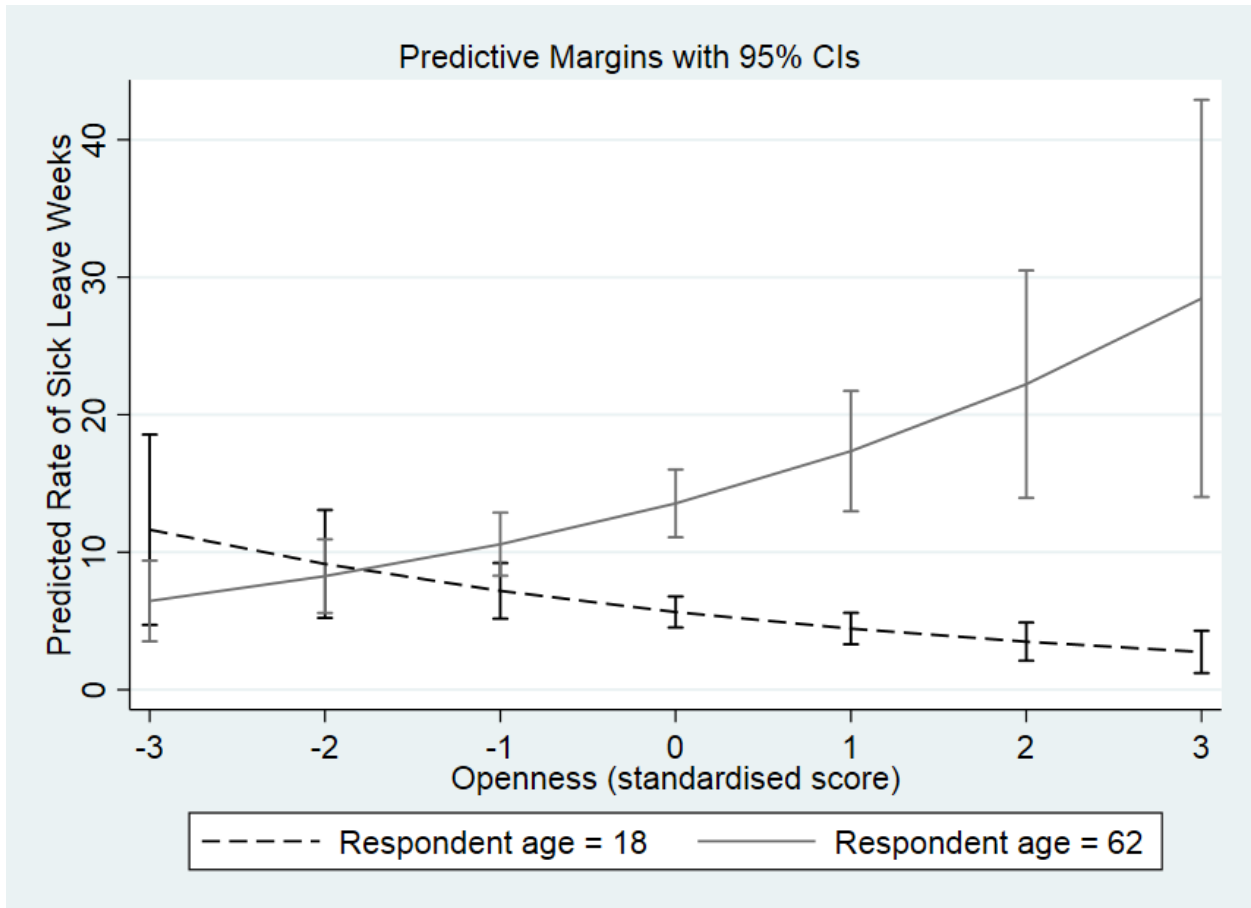
PERSONALITY AND SICKNESS ABSENCE
Figure 2

Predictive Margins of Sick Leave Weeks as a Function of Agreeableness and Type of Occupation