Physical Activity in Employees with Differing Occupational Stress and Mental Health Profiles: A Latent Profile Analysis

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Highlights

- Six classes with differing occupational stress and mental health profiles are identified
- Some classes show resilience to stress
- Resilience is associated with higher physical activity
- Physical inactivity is associated with an increased risk of not being in the resilient classes
- This risk is independent of social and demographic background

Abstract

Objectives: To examine whether employees with differing occupational stress and mental health profiles differ in their self-reported levels of physical activity.

Design: Cross-sectional survey data.

Method: The sample consisted of 2660 Swedish health care workers and social insurance officers (85% women, *M* = 46.3 years). Latent profile analysis was performed to identify classes. Between-class-differences in physical activity were tested via χ^2-tests and multinominal logistic regression analyses using sex, age, BMI, marital status, children at home, caregiving, and smoking as covariates.

Results: Latent profile analysis resulted in a six-profile solution. Two pairs of classes had equal stress levels, one pair with high stress, one pair with moderate stress. Within each pair, one group showed some resilience (i.e. only moderate mental health problems despite high stress or good mental health despite moderate stress), whereas the other did not. The other two classes were characterized by either low stress and good mental health or moderate-to-high stress and elevated mental health problems. Participants who were resilient to high or moderate stress were more active than participants of the corresponding non-resilient classes. Participants with low stress and good mental health reported the highest physical activity levels, participants with high stress and high mental health problems reported the lowest physical activity levels.

Conclusions: The findings suggest that physical activity is associated with resilience to occupational stress, and that beyond primary prevention efforts to make work less stressful regular physical activity should be a target variable for health professionals working in the occupational setting.

Keywords: Anxiety, Burnout, Depression, Effort-Reward Imbalance, Job Demand and Control, Physical Activity, Resilience, Stress

Physical Activity in Employees with Differing Occupational Stress and Mental Health Profiles: A Latent Profile Analysis

Stress-related mental health problems, such as burnout, depression and anxiety are an important public health issue, and are associated with increased turnover and absenteeism rates, reduced organizational commitment, and lower job performance (Cropanzano, Rupp, & Byrne, 2003). Burnout has a high temporal stability with studies showing that correlations over several years vary between .50 and .60 (Toppinen-Tanner, Kalimo, & Mutanen, 2002). Burnout has also been shown to be an important health hazard linked with cardiovascular diseases (Melamed, Shirom, Toker, Berliner, & Shapira, 2006), but also with poorer self-rated health (Gorter, Eijkman, & Hoogstraten, 2000) and various mental health problems including disturbed sleep (Grossi, Perski, Evengard, Blomkvist, & Orth-Gomer, 2003) and psychosomatic complaints (Gorter et al., 2000). Melamed et al. (2006) have further argued that if coping resources are depleted, symptoms of burnout can result into depressive disorders or more general anxiety disorders (cp. Ahola et al., 2005).

Nevertheless, although most employees encounter some degree of occupational stress, not all develop health problems due to this. To maintain a state of personal well-being, and to avoid downward spirals associated with high occupational stress, individuals need both coping skills and other resources to deal with stressful experiences to prevent the development of health problems such as depressive moods, burnout or other psychologically unhealthy conditions (Hobfoll, 1998).

Research on resilience describes why some individuals show unexpected positive outcomes although they face a high risk for maladjustment (Masten, 2001). Following Luthar, Cicchetti, and Becker (2000), two critical conditions are implicit within this notion: “(1) exposure to significant threat or severe adversity; and (2) the achievement of positive adaptation despite major assaults on the developmental processes” (p. 543). Thus, “the central objective of resilience researchers is to identify vulnerability and protective factors that might modify the negative effects of adverse life circumstances, and having accomplished this, to identify mechanisms or processes that might underlie associations found” (Luthar, Sawyer, & Brown, p. 106). Today, it is broadly acknowledged that resilience factors operate across multiple levels of influence including the individual, the family, the community and the society (Luthar et al., 2006). One variable discussed as being important as stress resilience factor is physical activity. The idea that physical activity can buffer stress has been discussed since the early 1980s. In their review, Gerber and Pühse (2009) concluded that such stress-buffer effects of physical activity were supported in more than 50% of adult studies. Despite the fact that chronic occupational stress constitutes the major source of distress in many people's lives, researchers have placed surprisingly little attention on the potential of physical activity to attenuate the harmful effects of job-related stress (Gerber & Pühse, 2009). Those studies that have focused on occupational stress provided mixed results. No support was found in a cross-sectional investigation with three cohorts of male managers and Master of Business Administration students using the Occupational Stress Indicator as a predictor, and job satisfaction and mental and physical wellbeing as outcomes (Siu, Cooper, & Leung, 2000). In contrast, more encouraging findings resulted from a study with Swiss police and emergency response officers (Gerber, Kellmann, Hartmann, & Pühse, 2010), in which occupational stress was measured with the Trier Inventory for Chronic Stress. This study supported that psychosomatic complaints associated with high levels of occupational stress are alleviated if officers reported high levels of physical activity.

Taken together, there is still a scarcity of studies concerning the potential of physical activity to protect against the negative health consequences of occupational stress. Moreover, some important shortcomings were identified in the existing literature: Firstly, none of the previous studies have used contemporary occupational stress theories to examine the stress-buffering potential of physical activity. Secondly, none of the previous investigations have concomitantly looked at burnout, depression and anxiety as mental health outcomes. This is surprising given that these constructs are highly prevalent in modern societies (Demyttenaere et al., 2004) and seem particularly suited to assess the impairments associated with job-related stress (Melamed et al., 2006). Thirdly, both previous studies have used a variable-centered approach (hierarchical regression analysis) to examine whether physical activity moderates the relationship between stress and mental health (Gerber et al, 2010; Siu et al., 2000). Hereby, researchers tested the interaction term between stress and physical activity to predict unique health outcomes. In contrast, a person-centered approach allows identifying types of participants with specific patterns of stress and mental health. Researchers argue that by simultaneously taking into account intra-individual variation in different variables, factor mixed models such as latent profile analysis provide a more holistic picture of an individual as an organized whole, and therefore may complement and extend traditional variable-centered research (Lubke & Muthén, 2005; Marsh, Lüdtke, Trautwein, & Morin, 2009).

To address the first shortcoming, three stress theories were combined in the present study: Resilience theory was used as the overarching concept (Luthar et al., 2006), while we used Karasek's (1979) Job Demand-Control (JDC) model and Siegrist's (1996) Effort-Reward Imbalance (ERI) model to assess long-term occupational stress. Karasek (1979) argued that job-related psychological strain results primarily from a combination of low decision latitude and high job demands, whereas Siegrist (1996) suggested that occupational stress is associated with a failed social reciprocity between high efforts spent and low rewards received. Thus, occupational stress is defined as an imbalance between two factors in both theories, and the difference between these variables is what helps to determine the stressfulness of a job situation.

The second shortcoming was tackled by utilizing three different mental health indicators: burnout (Melamed, Kushnir, & Shirom, 1992), depressive symptoms and anxiety (Zigmond & Snaith, 1983). All three instruments are well established and provide clinical cut-off scores. The latter is important because it allows judging more accurately the actual participant risk (Luthar et al., 2000).

The third shortcoming was addressed by using latent profile analysis, which is a special case of finite modeling operationalized by continuous indicator variables and a categorical latent variable (Adams et al., 2013; Pastor, Barron, Miller, & Davis, 2007). Latent profile analysis is a person-centered approach that shares certain similarities with factor analysis (explanation of covariation of observed variables through latent continuous variables). According to Marsh et al. (2009), "structural equation modeling and regression analyses take a variable-centered approach in which the aim is to predict outcomes, relate independent and dependent variables, or assess intervention effects" (p. 193). In contrast, person-centered approaches permit researchers “to identify typologies of people” (Aldridge & Roesch, 2008) by sorting individuals into mutually exclusive classes that maximize between-group variance and minimize within-group variance (Adams et al., 2013). While cluster analysis also allows categorizing participants into homogeneous groups, latent profile analysis has some major advantages over this traditional technique (Marsh et al., 2009; Pastor et al., 2007): First, cluster analysis is an exploratory approach, whereas latent profile analysis is model-based. Second and most importantly, latent profile analysis provides several fit indices, which enables a comparison between different models, and helps researchers making less arbitrary decisions regarding the optimal number of latent classes.

Given this background, the purpose of the present paper was four-fold: First, to explore whether different classes of people with differing stress and mental health profiles can be distinguished by means of latent profile analysis. Based on Fergus and Zimmerman (2005), our first hypothesis was that at least four classes with differing stress and mental health profiles can be detected. Fergus and Zimmerman conceptually distinguished four possible combinations of risk (low vs. high stress) and outcome (good vs. poor mental health).

Second, to test whether these classes are associated with physical activity. Based on previous literature regarding the stress-moderating potential of physical activity (Gerber & Pühse, 2009; Gerber et al., 2010), our second hypothesis was that these classes differ with regard to level of physical activity, and that participants having healthy (low stress and good mental health) and resilient profiles (few mental health problems despite elevated stress) self-report higher physical activity than colleagues with profiles characterized by higher degrees of stress and mental health problems.

Third, to assess whether the latent classes differ with regard to social and demographic background. Based on previous studies showing that caregiving is a challenging task, it was expected that caregivers are overrepresented in the classes with high stress levels and poor mental health (Kwak, Ingersoll-Dayton, & Kim, 2012). Given that clinical levels of burnout (Norlund et al., 2010) and depression (Kessler et al., 2003) are higher among women than men, it was expected that women are overrepresented in the classes with less favorable stress and mental health profiles. Previous research further indicated that employees with high BMI

(Ahola et al., 2012) might be overrepresented in the more burdened classes. No significant associations were expected for age, marital status, and children at home. Finally, no clear expectations existed for smoking because conflicting findings were identified for smoking status in previous research (Ahola et al., 2012; Norlund et al., 2010).

Fourth, to assess whether participants who engage in light (LPA) or moderate-to-vigorous physical activity (MVPA) have lower risks of being classified in the non-resilient classes. Although this is the first study that used a person-centered approach, the fourth hypothesis was that if participants who are resilient to high stress are used as a reference group, physically inactive participants are more likely to be classified in the corresponding non-resilient class than counterparts who engage either in LPA or MVPA after controlling for social and demographic background (Gerber et al., 2010).

Method

Study population and data collection

This study is based on the baseline data of a longitudinal survey with a random sample of health care workers and social insurance officers from Västra Götaland, Sweden. Several articles related to this survey have been published previously (Jonsdottir, Rödjer, Hadzibajramovic, Börjesson, & Ahlborg, 2010; Lindwall, Gerber, Jonsdottir, Börjesson, & Ahlborg, 2014; Lundgren-Nilsson, Jonsdottir, Pallant, & Ahlborg, 2012). In contrast to the present study, however, none of these reports analysed the data from a resilience perspective, used a person-centered approach towards data analysis or used JDC or ERI-ratios to establish participants' stress levels.

Baseline data was assessed by means of a postal questionnaire with a response rate of 61%. Criteria for inclusion were: at least one year of employment and a level of employment of at least 50%. Participants received detailed information about the purpose of the study and about the voluntary basis of their participation. All participants were assured of the confidentiality of their responses and gave informed consent. The study was carried out in accordance with the Declaration of Helsinki and was approved by the local ethical committee.

Complete data with regard to ERI, JDC, burnout, depression, anxiety, and physical activity was available for 2705 participants. Using the Mahalanobis distance criterion, 45 participants (1.7%) were identified as multivariate outliers based on their stress and mental health scores. After exclusion of multivariate outliers, the total sample consisted of 2660 participants with a mean age of 46.3 years (*SD* = 10.1). In the final sample, 15% were men (*n* = 402) and 85% were women (*n* = 2258); 20% (*n* = 539) were single, 80% (*n* = 2110) were married or living in a relationship (1 missing); 53% (*n* = 1410) were living together with children, while 47% (*n* = 1243) were not (7 missing); 9% (242) had social responsibility towards a relative in need of care, while 91% (*n* = 2383) had not (35 missing); 16% (*n* = 419) indicated that they were smokers, while 84% (*n* = 2238) were non-smokers (3 missing). The mean body mass index (BMI; assessed via self-reported weight in kg / height in m^2) was 24.6 (*SD* = 3.6; 23 missing).

Assessment of Occupational Stress

Job Demand and Control. The demand scale from the JDC model contains five items on a 4-point Likert-scale ranging from 1 (*never*) to 4 (*often*). For example, participants were asked whether their job requires them to work very fast, hard, or to accomplish large amounts of work. Participants also completed six items on the subscale pertaining to control (e.g., ‘I have freedom to make decisions about my job’). The items were summed to obtain subscale scores for job demand and job control. Because of the unequal number of items the JDC-ratio was calculated with the following formula: job demand / (job control * 0.8333). Values > 1 of the JDC-ratio indicated stress with possible adverse health effects (Karasek et al., 1998). The validity and reliability of this instrument has been established previously (Van der Doef & Maes, 1999).

Effort-Reward Imbalance. The effort scale from the ERI model consists of five items anchored on a 5-point Likert-scale from 1 (*none*) to 5 (*very high*). Sample items were: ‘I have a lot of responsibility in my job’ or ‘I have many interruptions and disturbances in my job.’ The reward scale consists of 11 items with the same semantic anchors (e.g., ‘I receive the respect I deserve from my superior or a respective relevant person.’ or ‘Considering all my efforts and achievements, my job promotion prospects are adequate.’). Due to the unequal number of items, the ERI-ratio was calculated with the following formula: effort / (reward * 0.4545). This measure proved to be a valid and reliable measure previously (Rödel, Siegrist, Hessel, & Brähler, 2004; Siegrist et al., 2004). ERI-ratio scores above 1 reflect higher levels of job stress (Siegrist, 1996; Siegrist et al., 2004).

Assessment of Burnout Symptoms

Burnout symptoms were measured with the Shirom-Melamed Burnout Questionnaire (SMBQ) (Melamed et al., 1992). The SMBQ consists of 22 items in four subscales with response options anchored on a 7-point Likert scale varying from 1 (*almost never*) to 7 (*almost always*). The four subscales are physical fatigue (e.g., 'My batteries are dead.'), cognitive weariness (e.g., 'I have difficulty thinking about complex things.'), tension (e.g., 'I feel tense.'), and listlessness (e.g., 'I feel alert.'). Five items are reverse scored. Mean scores were calculated to generate an overall index. The SMBQ proved to be a valid and reliable questionnaire in prior research (Lundgren-Nilsson et al., 2012). Shirom and Melamed (2006) have shown that the construct validity of the SMBQ is, at the very least, as robust as the Maslach Burnout Inventory (MBI). Furthermore, they argued that whereas the MBI lacks a clear theoretical rationale for combining the three subscales, the depleted energetic resources covered by the SMBQ can be subsumed under Hobfoll's (1998) Conservation of Resources (COR) theory. Thus, the SMBQ seemed more meaningful from a theoretical viewpoint, especially as we wanted to use a total burnout score. Scores of ≥ 4.40 were deemed to be burnout according to the clinical threshold (Lundgren-Nilsson et al., 2012).

Assessment of Symptoms of Anxiety and Depression

The Hospital Anxiety and Depression Scale (HADS) was used to measure depression and anxiety (Zigmond & Snaith, 1983). The HADS is a widely used instrument originally designed for non-psychiatric clinics. The HADS consists of 14 items, seven for the depression and anxiety subscales. Subscale scores are based on participants' answers to one out of four response options on a Likert-scale from 0 (*never*) to 4 (*almost always*) regarding mood changes that may occur during the course of depression (e.g., 'I still enjoy the things I used to enjoy.') or anxiety (e.g., 'I get sudden feelings of panic.'). The HADS has shown to be a valid and reliable instrument in previous investigations (Bjelland, Dahl, Haug, & Neckelmann, 2002). Scores were summed to obtain two overall indices. Scores > 10 were classified as clinically relevant levels of depression and anxiety.

Assessment of Physical Activity

Physical activity was assessed with Saltin's (1977) widely used 4-level scale. This scale distinguishes between participants who are mostly physically inactive (level 1), who engage in LPA at least two hours a week (e.g. light gardening, walking or bicycling: level 2), who report at least two hours per week of moderate physical activity (e.g. aerobics, dancing, swimming, playing soccer, heavy gardening: level 3), or who participate in at least five hours of vigorous activity several times per week (level 4). This instrument successfully discriminates between physically inactive and active individuals regarding their maximal oxygen uptake (Saltin, 1977), has been validated against biological measures (Aires, Selmer, & Thelle, 2003; Rödjer et al., 2012), and associations were found between high levels of physical activity and lower risks for morbidity and premature death (Apullan et al., 2008; Byberg et al., 2009; Wilsgaard & Jacobsen, 2007). Furthermore, Lindwall, Ljung, Hadzibajramovic, and Jonsdottir (2012) showed that physical activity levels assessed with this instrument were more closely associated with mental health outcomes than a measure of cardiorespiratory fitness.

Statistical analysis

Descriptive statistics, Cronbach's alphas, and Pearson's correlation coefficients between all variables were calculated using SPSS 21 for Mac. Mplus software (version 7.1) was used to perform latent profile analysis. Model parameters were estimated using maximum likelihood (ML) estimation. Latent profile analysis was performed with five continuous observable variables (ERI-ratio, JDC-ratio, burnout, depression, anxiety). Although no "gold standard" exists that allows researchers to establish the optimal number of underlying classes in a given population, Marsh et al. (2009) suggested that "it is useful to explore solutions with varying numbers of groups and to select one that makes most sense in relation to theory, previous research, the nature of the groups and interpretation of the results – as well as alternative goodness-of-fit indexes and tests of statistical significance". In nested models, researchers can test whether more complex models fit the data better than more parsimonious models. In the present study, solutions of 1 to 7 classes were tested to identify the ideal number of classes. Model fit criteria were inspected across solutions to determine the best fit to the data (cp. Adams et al., 2013). In a first step, a bootstrapped Lo-Mendell-Rubin likelihood test (LMR: Lo, Mendell, & Rubin, 2001) was used to compare the fit of two models. Classes were added iteratively to identify the best model fit. A significant LMR test ($p < .05$) indicates that the target class solution fits better with the data than a class solution with one fewer class. In a second step, the Bayesian Information Criterion (BIC; Henson, Reise, & Kim, 2007) and the sample-size adjusted BIC (SSA-BIC; Yang, 2006) were inspected, with lower values indicating better model fit. The entropy criterion was also examined, which indicates how accurate people are classified into their respective profiles, with higher values indicating a better fit for a given solution (Aldridge & Roesch, 2008). Finally, z-scores of the observable variables were used to interpret the latent profile analysis solution from a theoretical point of view.

Differences between the latent classes with regard to physical activity (0 = inactive, 1 = engaged in LPA, 2 = engaged in MVPA), sex (0 = male, 1 = female), marital status (0 = single vs. 1 = married or in relationship), children at home (0 = no children, 1 = ≥1 child), social responsibility towards relatives in need of care (0 = no responsibility, 1 = responsibility), and smoking (0 = non-smoking, 1 = smoking) were tested with χ^2-tests, between-class-differences in age and BMI with analyses of variance (ANOVAs). Multinominal logistic regression analysis (MLRA) was used to test whether physically inactive participants are underrepresented in the classes with healthy and resilient profiles compared to their counterparts who engage in LPA or MVPA. To this end, a two-step approach was applied. In the first step, a MLRA was carried out with physical activity as a fixed factor and class membership as a dependent variable. The classes with healthy and resilient profiles were used as a reference group in three independent analyses. In the second step, this procedure was repeated with sex, marital status, children at home, caregiving, smoking, age and BMI as covariates. Odds ratios (OR) in combination with the corresponding 95% confidence intervals (CI) are presented as estimates of effect measures.

Results

Descriptive Statistics, Cronbach's Alphas and Correlation Analyses

Descriptive statistics and Cronbach's alphas are presented in Table 1. In total, 12.9% (*n* = 343) of the participants had an ERI-ratio ≥ 1, 35.1% (*n* = 934) had a JDC-ratio ≥ 1, 15.8% (*n* = 419) reported clinical burnout, 3.3% (*n* = 85) reported symptoms corresponding to clinical depression levels, and 11.7% (*n* = 310) reported symptoms corresponding to clinical anxiety. Moreover, 14.5% (*n* = 387) of the participants were physically inactive, 53.3% (*n* = 1419) engaged in LPA, and 29.6% (*n* = 788) in MPA and 2.5% (n = 66) in VPA. Because only 2.5% of the participants reported VPA, we reduced categories to three distinctive groups by combining the MPA and VPA into a MVPA group (32.1%, *n* = 854).

Table 1 further shows that all variables were correlated. Both an imbalance between high job demands and low job control as well as an imbalance between high work-related effort and low reward were associated with increased levels of burnout, depression and anxiety (r = .32 to .40, $p < .001$). Physical activity was weakly associated with decreased stress (r = -.08, $p < .001$), and decreased mental health problems (r = -.15 to -.25, $p < .001$).

Identifying Classes with Differing Stress and Mental Health Profiles

The adjusted LMR test, BIC, and SSA-BIC indicate that a 6-class solution fits the present data better than a 5-class solution (Table 2). Although some model fit estimates improved within a 7-class solution (log-likelihood statistics, BIC, SSA-BIC), both the LMR test and entropy criterion indicated that the model fit does not improve with a more complex model. Furthermore, the 6-group solution provided a plausible representation of our data from a resilience perspective showing that some classes experience equal stress levels, but differ in terms of mental health problems (see Figure 1).

Table 3 shows that participants in class 1 (*n* = 151, 6%) reported high stress scores (ERI- and JDC-ratios > 1) and poor mental health. In this class, 99% (*n* = 150) of the participants reported clinical burnout, 41% (*n* = 62) reported clinical depression, and 88% (*n* = 133) reported clinical anxiety. For simplicity, class 1 is labeled as "highly burdened" class. Participants in class 2 (*n* = 281, 11%) did not statistically differ from those in class 1 with regard to their stress level. However, they reported significantly lower mental health problems. In this class, only very few participants reported clinical burnout (*n* = 1, 0%) or anxiety (*n* = 5, 2%). For convenience, class 2 is labeled as “resilient to high stress”. Class 3 (n = 540, 20%) reported somewhat lower, but still above-average stress levels. Overall, participants in this class experienced relatively poor mental health, with 47% (*n* = 251) reporting clinical burnout, 4% (*n* = 23) reporting clinical depression, and 30% (*n* = 163) reporting clinical anxiety. Given this profile, this class is conveniently labelled as “stressed”. Class 4 (*n* = 523, 20%) was characterized by above-average mental health problems, despite relatively low stress. In this class, 3% (*n* = 17) reported clinical burnout, and 2% (*n* = 9) clinical anxiety. This class is referred to as the “moderately stressed” class. Participants in class 5 (*n* = 749, 28%) reported equal levels of stress as counterparts in the “moderately stressed” class. However, this group reported below-average mental health problems, with a percentage of participants reporting clinical burnout, depression and anxiety being 0%. Therefore, this class is labeled as “resilient to moderate stress”. Finally, participants falling in class 6 (*n* = 334, 12%) reported even lower stress levels in combination with good mental health. As none of the participants in this class had clinical levels of burnout, depression or anxiety, this class is referred to as the “low stress and healthy” class.

Between-Class Differences in Physical Activity

A χ^2-test revealed significant between-class differences in physical activity. As shown in Table 4, the lowest percentage of physically inactive participants was found in the “low stress and healthy” class (5%), followed by the “resilient to moderate stress” class (8%). In comparison, the portion of physically inactive participants was higher in the other four classes (“resilient to high stress”: 14%; “moderately stressed”: 16%, “stressed”: 23%, “highly burdened”: 35%).

Between-Class Differences in Social and Demographic Background

Table 4 further shows that participants with caregiving responsibilities were overrepresented in the “highly burdened” and “stressed” classes, and underrepresented in the “moderately stressed”, resilient and healthy classes. No significant between-class differences were found with regard to participants’ sex, marital status, children at home, smoking and age. Participants in the “highly burdened”, “stressed”, and “moderately stressed” classes had slightly higher BMI scores than the other three groups.

Prediction of Class Membership With Physical Activity, Social and Demographic Background

Given that the classes differed with regard to some social and demographic background variables, multinominal logistic regression analyses (MLRA) were performed to examine the odds dependent of participants’ physical activity levels of being classified into the “highly burdened” and “stressed” classes when then “resilient to high stress” class was used as a reference group.

Table 5 shows that in the uncontrolled model (Model 1), participants who engaged in MVPA were significantly less likely than physically inactive individuals to have a “highly burdened” (OR = 0.21) or “stressed” (OR = 0.39) profile. Interestingly, participants who engaged in LPA also had reduced odds. Nevertheless the odds were not as low as those for counterparts who participated in MVPA (“highly burdened”: LPA: OR = 0.38 vs. MVPA: OR = 0.21; “stressed”: LPA: OR = 0.67 vs. MVPA: OR = 0.39). Table 5 further shows that the odds ratios remained nearly unchanged after controlling for social and demographic background (Model 2). Of the social and demographic background variables, a higher BMI was associated with a slightly decreased risk of being categorized in the “highly burdened” (OR = 1.06) or “stressed” (OR = 1.05) classes. Increased odds were also observed for having children at home (“highly burdened”: OR = 1.82; “stressed”: OR = 1.48). On the other hand, being in a relationship was associated with a reduced risk of falling in the “highly burdened” (OR = 0.59) and “stressed” (OR = 0.65) classes. In summary, these findings show that being physically inactive constitutes a salient risk factor of having either a “highly burdened” or “stressed” profile versus a “resilient to high stress” profile. Furthermore, this risk factor is independent of social and demographic background. Finally, LPA and MVPA are both associated with a substantially reduced risk of being categorized in the “highly burdened” or “stressed” classes. Nevertheless, the risk is almost twice as low for MVPA compared to LPA.

Additional analyses were performed with the “low stress and healthy” class and the “resilient to moderate stress” classes as reference groups. These analyses are provided as supplementary online material. Taken together, these analyses show a similar picture: (a) being physically inactive is an influential risk factor of not being classified in these two classes, (b) this risk factor is independent of social and demographic background, and (c) both LPA and MVPA are associated with a substantially reduced risk.

Discussion

This study aimed at deriving meaningful classes with differing occupational stress and mental health profiles from a large sample of Swedish health care workers and social insurance officers, and exploring how classes are associated with physical activity before and after controlling for social and demographic background.

The present study showed that physical activity is associated with healthy and resilient profiles among individuals working in the public service sector. The findings highlight that beyond primary prevention efforts to make work less stressful regular physical activity should be a target variable for health professionals working in an occupational setting. This study extends previous research in that (a) a person-centered approach was used towards the examination of the relationship between stress, physical activity and health, (b) contemporary stress theories were employed to operationalise stress, (c) some of the most common symptoms were used to assess mental health, and (d) clinically relevant cut-off points were considered to estimate the actual risk of the participants in the identified classes.

The findings of the current study are relevant from several perspectives. First, many employees experience burnout symptoms as a result of high occupational stress. This notion was confirmed with the present data: In the total sample, 28% of the participants self-reported high levels of burnout (SMBQ $\geq$ 3.75) and 16% suffered from severe burnout (SMBQ $\geq$ 4.40). This indicates that the prevalence of burnout in the present sample was even higher than in previous investigations (Ahola et al., 2005). Norlund et al. (2010) who used the same burnout measure in a relatively large adult sample in northern Sweden reported that the portion of participants with SMBQ scores > 4.0 was 10% among males and 16% among females (in the present study, 21% of males and 23% of females had scores > 4.0). Second, occupational stress was significantly correlated with symptoms of burnout, depression and anxiety, which parallels previous research showing that occupational stress, symptoms of burnout and mental health are associated (Melamed et al., 2006). Finally, scholars suggested that mental disorders incur the risk of wasting human potential (Goetzel et al., 2004). It is therefore worthwhile to foster resilient functioning instead of intervening when disorders have already appeared (Luthar et al., 2006).

Four hypotheses were formulated, and they are now discussed one after another. The first hypothesis was supported: Several classes were identified that distinguish between employees who share differing profiles of occupational stress, burnout and symptoms of depression and anxiety. Whereas Fergus and Zimmerman (2005) conceptually derived four classes (high vs. low stress in combination with good vs. poor mental health), the data of the present study revealed six distinct stress and mental health profiles. One class was resilient to high stress, whereas another class showed resilience to moderate stress. The fact that almost 40% of the participants reported positive mental health despite either moderate (28%) or high (11%) occupational stress was congruent with Masten's (2001) notion of ordinariness of resilience. This means that resilience is a common phenomenon, and "does not come from rare and special qualities, but from the everyday magic of ordinary, normative human resources in the minds, brains, and bodies" of people, in their families and relationships, and in their communities (Masten, 2001, p. 235). In contrast, the fact that 23% of the participants reported relatively low mental health without being exposed to high occupational stress suggests that other sources of distress (beyond occupational stress) can affect workers' well-being (Phelan et al., 1991).

The second hypothesis was also confirmed. Among participants with similar stress levels, those with better mental health reported higher levels of physical activity than colleagues with more mental health problems. The portion of physically inactive participants was 8% in the "resilient to moderate stress" versus 16% in the "moderately stressed" class, and 14% in the "resilient to high stress" versus 35% in the "highly burdened" class. This finding accords with a prior study with Swiss police and emergency response officers suggesting that physical activity may have the potential to moderate the relationship between job stress and health (Gerber et al., 2010). Thus, regular exercisers seem to cope more efficiently with stress likely because of many different factors (Gerber, Lindwall, Lindegård, Börjesson, & Jonsdottir, 2013). For example, physical activity might offer a “time-out” from occupational demands. Secondly, the effects might be due to higher fitness levels and blunted physiological reactivity on cognitive and psychosocial stressors (Hamer, Taylor, & Steptoe, 2006). Thirdly, physical activity might protect against the sleep problems by preventing stress-related dysfunctional cognitions associated with poor sleep (Brand, Gerber, Pühse, & Holsboer-Trachsler, 2010; Loprinzi & Cardinal, 2011). Finally, the effects of physical activity might be mediated via other personal and social resources (Gerber et al., 2012).

Partial support was found for the third hypothesis. That is, the classes differed with regard to some, but not all social and demographic background variables. The most influential factor was having social responsibility towards relatives in need of care. Participants with caregiver responsibility were significantly overrepresented in the “highly burdened” and “stressed” classes. This accords with studies showing that giving care for relatives is a challenge (Barnett, 2014; Kwak et al., 2012). Against our expectation, women were not overrepresented in the highly burdened class although women had higher levels of clinical burnout (Norlund et al., 2010) and depression (Kessler et al., 2003) in previous studies than men. Furthermore, the present data supported that having an increased BMI is associated with an increased risk of having a less favorable stress and mental health profile (Ahola et al., 2012). Finally, although the χ^2-tests did not reveal further associations with social and demographic background variables, the direct comparison of different classes suggested that living in a relationship is associated with some degree of resilience to high stress. Thus, having a domestic partner seems to be a source of support in times of heightened stress (Cairney, Boyle, Offord, Racine, 2003). Finally, the current data show that living with children at home is associated with lower levels of resilience if participants are exposed to high stress. This accords well with the notion that some working parents find it difficult to adopt a balance between work and family, which might increase their risk for mental health problems (Higgins & Duxbury, 2000).

Finally, full support was found for the fourth hypothesis, which posits that if the participants who show resilience to high stress are used as a reference group, physically inactive participants are more likely to be classified in the “highly burdened” or “stressed” classes than counterparts who engage in LPA or MVPA, before and after controlling for social and demographic background. Thus, it can be ruled out that between-class-differences in physical activity are due to these extraneous factors. It is, however, not certain that physical activity behavior is entirely responsible for the resilience among individuals with elevated stress and positive mental health. Other factors such as social support, less social responsibility compared to the non-resilient group, as well as other lifestyle factors such as sleep could have contributed to the resilience (Ozbay, Fitterling, Charney, & Southwick, 2008; Söderström, Jeding, Ekstedt, Perski, & Åkerstedt, 2012). Healthy lifestyle and other positive factors in life are likely to co-exist and thus individuals who exercise regularly are also more likely to generally live healthier (de Bourdeaudhuij & van Oost, 1999). Nevertheless, previous research has shown that physical activity can be successfully promoted via interventions (Conn, Hafdahl, Cooper, Brown, & Lusk, 2009). Consequently, workplace health promoters should continue envisaging strategies to get physically inactive employees moving through motivational and volitional intervention programs. Finally, while both LPA and MVPA were related to resilience to high stress in the present study, the data suggest that MVPA is associated with a higher reduced risk than LPA. This finding can be interpreted in different ways: First, already low levels of physical activity are associated with stress resilience, which might suggest that the current health-related physical activity guideline of 150 minutes of MVPA per week might be too high for the prevention of mental illnesses. Second, the fact that already LPA is associated with resilience might be attributable to a methodological artefact because in the present study cycling was included as an example of LPA in the activity scale, whereas in other research (e.g. Ainsworth et al., 2000) cycling was understood as a moderate intensity activity.

The strengths of the present study were that: (i) a relatively large sample was used to identify the classes, (ii) a random selection procedure was applied to recruit the participants, and (iii) several social and demographic factors were controlled when predicting class membership via physical activity levels. Nevertheless, several limitations of this study should be acknowledged. First, all information was based on self-reports. Particularly, the assessment of physical activity was based on a relatively simple 1-item measure, which does not allow for an examination of intricacies of physical activity engagement (type, domain, etc.). Second, the instrument to assess physical activity did not differentiate between work-related and non-work physical activity. Third, mental health problems were emphasized, while other outcomes such as cardiovascular health were not considered. Fourth, the majority (85%) of participants in the present study were women working in two specific occupational sectors (health care and social insurance). This limits the generalizability of the findings. As mentioned previously, the level of mental health problems was higher compared to another population-based study with Swedish employees (Norlund et al., 2010). Lastly, due to the cross-sectional nature of the data, comparing classes with differing stress and mental health profiles did not allow firm conclusions about cause and effect. Thus, while regular exercisers might cope more efficiently with stress, it could be that workers who cope successfully with stress are more likely to maintain a physically active lifestyle. Nevertheless, previous analyses showed that increased physical activity predicts mental health over time (Jonsdottir et al., 2010).

Conclusions

The present study suggests that physical activity can help public service employees to deal with occupational stress. As many employees experience high occupational stress and poor mental health, identifying factors associated with stress resilience is relevant to establish effective prevention and health promotion measures.

Using the resilience framework may help health service providers to select employees in need for health promotion, and thus tailoring measures more towards the needs of employees. The relevant next question that could be addressed in future controlled trials is whether physical activity deploys particularly beneficial effects in individuals with highly burdened or stressed profiles. Conservation of Resources (COR) theory assumes that individuals who perceive the negative consequences of stress might adopt a defensive posture towards health promotion to guard their available resources. Regular physical activity may provide experiences of mastery and help workers get more physically fit, which may serve as a first step towards the replenishment of their resources.

Conflict of Interest

The authors have no competing interests to report.

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Table 1

Descriptive Statistics, Cronbach's Alpha and Correlations Between the Variables Used to Identify the Classes, and Physical Activity

	M	*SD*	Range	Skewness	Kurtosis	α	2.	3.	4.	5.	6.
1. ERI-ratio	0.71	0.26	0.20-1.97	0.89	1.45	---	.55	.40	.35	.37	-.08
2. JDC-ratio	0.93	0.23	0.27-2.07	0.60	0.78	---	---	.37	.32	.33	-.08
3. Burnout	3.03	1.23	1-7	0.58	-0.38	.97		---	.79	.79	-.25
4. Depression	3.34	3.09	0-16	1.16	0.75	.87			---	.72	-.23
5. Anxiety	5.46	3.86	0-19	0.73	0.04	.87				---	-.15
6. Physical Activity	2.20	0.71	1-4	0.11	-0.03	---					---

Note. *N* = 2660, all correlations significant at $p < .001$. α = Cronbach's Alpha, ERI = Effort-Reward Imbalance, JDC = Job Demand and Control.

Table 2

Fit Indices, Entropy, and Model Comparisons for Estimated Latent Profile Analyses Models

Models	Log-likelihood	BIC	SSA-BIC	Entropy	Adjusted LMR test
One class	-18874.70	37828.26	37796.49	1.00	
Two classes	-15897.63	31960.87	31894.14	.87	5886.29*
Three classes	-15089.30	30430.95	30329.27	.85	1598.25*
Four classes	-14842.20	30023.51	29886.88	.80	488.55*
Five classes	-14668.20	29762.24	29590.67	.81	344.04*
Six classes	**-14513.73**	**29540.05**	**29333.53**	**.78**	**305.41***
Seven classes	-14426.90	29453.13	29211.66	.76	171.69 *ns*

Note: BIC = Bayesian Information Criterion; SSA-BIC = Sample Size Adjusted Bayesian Information Criterion; Adjusted LMR test = Adjusted Lo-Mendell-Rubin likelihood ratio test. Bold corresponds to the model with the best fit.
*$p < .01$. *ns* = non-significant

Table 3

Between-Class-Differences in the Variables Used to Identify the Classes

	Class 1: Highly burdened (n = 151)		*Class 2: Resilient to high stress (n = 281)*		*Class 3: Stressed (n = 540)*		*Class 4: Moderately stressed (n = 605)*		*Class 5: Resilient to moderate stress (n = 749)*		*Class 6: Low stress and healthy (n = 334)*				
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*F*	*p*	η^2
ERI-ratio	1.01[a]	0.34	0.95[a]	0.22	0.85	0.25	0.61[b]	0.16	0.61[b]	0.18	0.57	0.21	278.85	< .001	.344
JDC-ratio	1.14[a]	0.23	1.18[a]	0.20	1.06	0.23	0.83[b]	0.14	0.85[b]	0.17	0.78	0.18	288.17	< .001	.352
Burnout	5.68	0.50	2.94	0.60	4.33	0.56	3.16	0.64	2.18	0.43	1.50	0.27	2455.12	< .001	.822
Depression	10.13	2.34	2.35	1.54	6.70	2.08	3.35	1.62	1.20	0.64	0.45	0.50	1797.19	< .001	.77
Anxiety	13.53	2.47	5.10	2.59	9.23	2.41	5.60	2.23	3.16	1.60	0.91	0.88	1357.99	< .001	.72
Participants above clinical thresholds															
	n	%	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%	χ^2	*p*	ϕ
Burnout	150	99	1	0	251	47	17	3	0	0	0	0	1508.26	< .001	.60
Depression	62	41	0	0	23	4	0	0	0	0	0	0	766.81	< .001	.47
Anxiety	133	88	5	2	163	30	9	2	0	0	0	0	1266.93	< .001	.57

Note. ERI = Effort-reward imbalance. JDC = Job Demand and Control. Bonferroni post hoc tests: Mean values with equal letters are not significantly different ($p > .05$).

Table 4

Between-Class-Differences in Physical Activity, and Social and Demographic Background

	Class 1: Highly burdened	*Class 2: Resilient to high stress*	*Class 3: Stressed*	*Class 4: Moderately stressed*	*Class 5: Resilient to moderate stress*	*Class 6: Low stress and healthy*			
	n %	*n* %	*n* %	*n* %	*n* %	*n* %	χ^2	*p*	ϕ
Physical activity							175.02	< .001	.25
Physically inactive	53 35	40 14	125 23	96 16	56 8	17 5			
LPA	70 46	141 50	293 54	343 57	398 53	174 52			
MVPA	28 19	100 36	122 23	166 27	295 39	143 43			
Sex							6.35	*ns*	.05
Male	16 11	33 12	89 16	93 15	121 16	50 15			
Female	135 89	248 88	451 84	512 85	628 84	284 15			
Marital status							9.28	*ns*	.06
Single	37 25	52 19	124 23	129 22	129 17	68 20			
Married or in relationship	114 76	228 81	413 77	474 79	616 83	265 80			
Children at home							7.31	*ns*	.05
No children	58 38	139 50	242 45	282 47	364 49	158 47			
≥ 1 children	93 62	142 51	298 55	321 53	380 51	176 53			
Social responsibility							41.52	< .001	.13
No responsibility	120 83	249 89	461 86	550 92	694 94	309 95			
Responsibility	25 17	30 11	75 14	49 8	46 6	17 5			
Smoking							6.67	*ns*	.05
No	121 81	232 83	444 82	508 84	645 87	288 86			
Yes	29 19	49 17	96 18	95 16	104 14	46 14			
	M SD	*M SD*	*M SD*	*M SD*	*M SD*	*M SD*	*F*	*p*	η^2
Age	45.9 9.6	45.1 10.4	46.8 9.8	16.4 10.0	46.1 10.3	46.9 10.1	1.41	*ns*	.003
BMI	25.3 4.1	24.2 3.2	25.1 4.0	24.8 3.7	24.1 3.4	24.5 3.4	6.50	< .001	.012

Note. LPA = Light Physical Activity. MVPA = Moderate-to-Vigorous Physical Activity. BMI = Body Mass Index.

Table 5

Odds Ratios Dependent on Self-Reported Physical Activity for Being Classified into a Specific Class with the "Resilient to High Stress" Class as Reference Group

	Resilient to high stress vs.									
	… highly burdened		*… stressed*		*… moderately stressed*		*… resilient to moderate stress*		*… low stress and healthy*	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Model 1: Uncontrolled										
Physical activity										
Physically inactive	1		1		1		1		1	
LPA	**0.38**	**0.23; 0.62**	**0.67**	**0.44; 0.99**	1.01	0.67; 1.54	**2.02**	**1.29; 3.16**	**2.90**	**1.58; 5.34**
MVPA	**0.21**	**0.12; 0.38**	**0.39**	**0.25; 0.61**	0.69	0.44; 1.08	**2.11**	**1.32; 3.35**	**3.37**	**1.81; 6.27**
Model 2: Controlled for social and demographic background										
Physical activity										
Physically inactive	1		1		1		1		1	
LPA	**0.40**	**0.24; 0.67**	**0.70**	**0.46; 1.08**	0.99	0.65; 1.53	**1.81**	**1.14; 2.88**	**3.25**	**1.71; 6.16**
MVPA	**0.23**	**0.13; 0.43**	**0.46**	**0.26; 0.66**	0.71	0.44; 1.12	**1.89**	**1.17; 3.07**	**2.68**	**1.44, 4.97**
Age	1.01	0.99; 1.03	1.02	0.99; 1.03	1.02	0.99; 1.03	1.02	0.99; 1.03	1.02	0.99; 1.04
BMI	**1.06**	**1.00; 1.12**	**1.05**	**1.01; 1.09**	1.04	0.99; 1.08	0.99	0.95; 1.04	1.03	0.98; 1.08
Sex	1.01	0.53; 1.93	1.52	0.98; 2.37	1.36	0.88; 2.11	1.39	0.91; 2.11	1.18	0.73; 1.92
Marital status	**0.59**	**0.35; 0.99**	**0.65**	**0.45; 0.96**	0.73	0.50; 1.06	0.99	0.68; 1.44	0.77	0.50; 1.17
Social responsibility	1.48	0.82; 2.67	1.21	0.76; 1.92	0.70	0.43; 1.13	**0.54**	**0.33; 0.88**	**0.43**	**0.23; 0.80**
Children at home	**1.82**	**1.17; 2.83**	**1.48**	**1.08; 2.03**	1.33	0.98; 1.80	1.11	0.83; 1.49	1.29	0.92; 1.83
Smoking	0.81	0.47; 1.40	0.91	0.61; 1.35	0.84	0.57; 1.24	0.82	0.56; 1.21	0.83	0.53; 1.30

Note. LPA = Light Physical Activity. MVPA = Moderate-to-Vigorous Physical Activity. BMI = Body Mass Index. Bold coefficients: $p < .05$. Bold corresponds to differences with p < .05.

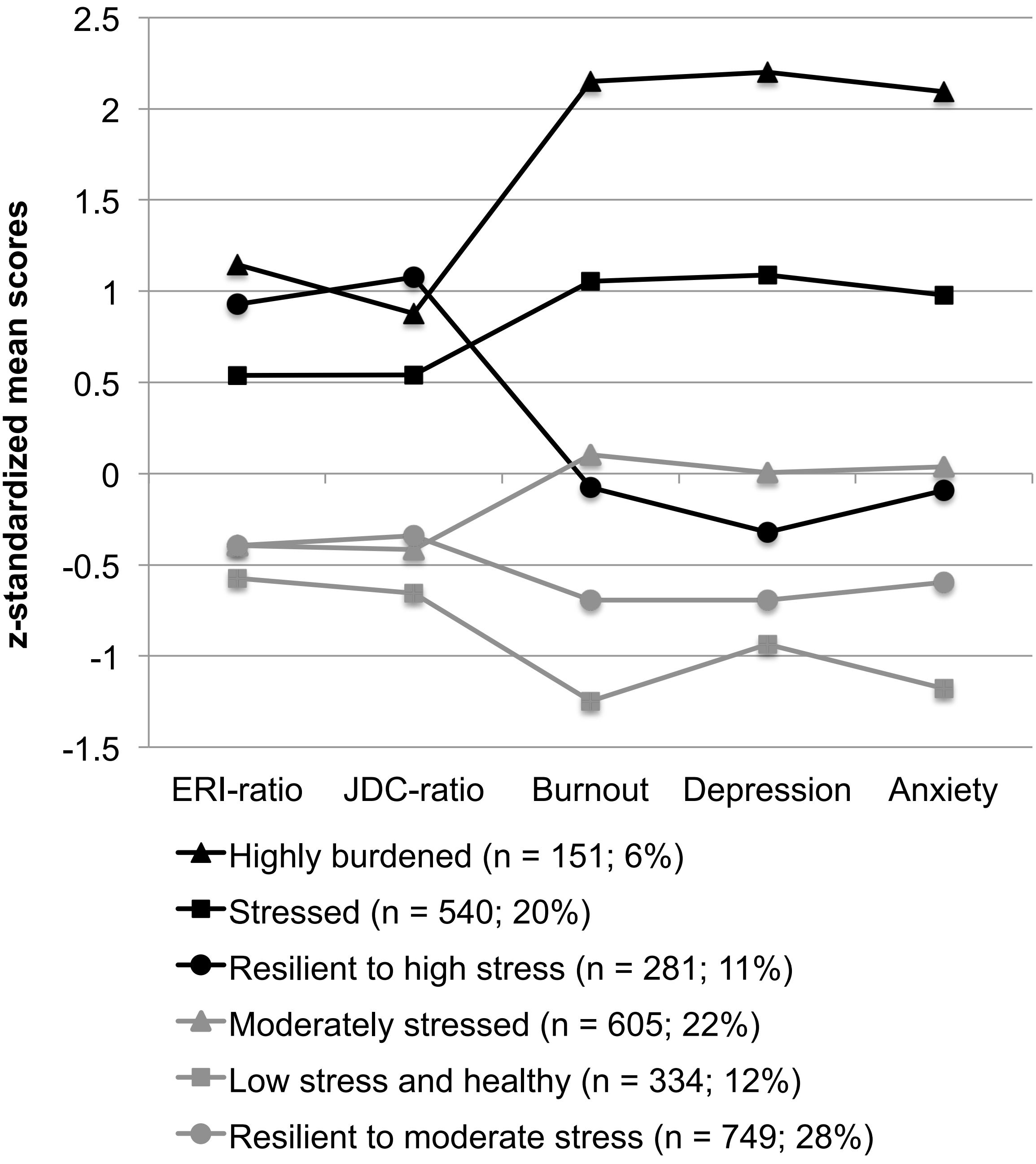

Figure 1. Classes Identified in the Total Sample Through Latent Profile Analysis

(*Note.* ERI = Effort-Reward Imbalance, JDC = Job Demand and Control, *N* = 2660)

Supplementary online material

Physical Activity in Employees with Differing Occupational Stress and Mental Health Profiles: A Latent Profile Analysis

Multinominal Regression Analyses with the “Low Stress and Healthy” Class as a Reference Group

When the “low stress and healthy” class was used as a reference group in the multinominal regression analyses, the following picture emerged (Table 1): In the uncontrolled model (Model 1), participants who engaged in MVPA were significantly less likely than physically inactive individuals to be classified in the “highly burdened” (OR = 0.06), “stressed” (OR = 0.12), “moderately stressed” (OR = 0.12), and “resilient to high stress” (OR = 0.30) classes. No differing likelihood was found for the “resilient to moderate stress” class (OR = 0.63). Interestingly, participants who engaged in LPA had almost the same reduced odds of being categorized in the respective classes as counterparts who participated in MVPA. Table 1 further shows that the odds ratios remained nearly unchanged after controlling for social and demographic background (Model 2). Of the social and demographic background variables, responsibility towards relatives in need of care was associated with an increased likelihood of being classified in the “highly burdened” (OR = 3.47), “stressed” (OR = 2.84), and “resilient to high stress” class (OR = 2.35). No significant association was found for the other social and demographic factors. In summary, these findings show that (a) being physically inactive is an influential risk factor of not being classified in the “low stress and healthy” class, (b) this risk factor is independent of social and demographic background, (c) both LPA and MVPA are associated with a substantially reduced risk, and (d) the risk associated with physical inactivity increases gradually with augmented levels of burden. That is to say, the highest risk is observed if the “low stress and healthy” class is compared against the “highly burdened” class, followed by the “stressed”, the “moderately stressed”, and the “resilient to high stress” class.

Table 1

Odds Ratios Dependent on Self-Reported Physical Activity for Being Classified into a Specific Class with the "Low Stress and Healthy" Class as Reference Group

	Low stress and healthy vs.									
	… highly burdened		*… resilient to high stress*		*… stressed*		*… moderately stressed*		*…resilient to moderate stress*	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Model 1: Uncontrolled										
Physical activity										
Physically inactive	1		1		1		1		1	
LPA	**0.13**	**0.07; 0.24**	**0.34**	**0.12; 0.26**	**0.23**	**0.13; 0.39**	**0.35**	**0.20; 0.60**	0.69	0.35; 1.12
MVPA	**0.06**	**0.03; 0.12**	**0.30**	**0.16; 0.55**	**0.12**	**0.07; 0.20**	**0.21**	**0.12; 0.36**	0.63	0.39; 1.23
Model 2: Controlled for social and demographic background										
Physical activity										
Physically inactive	1		1		1		1		1	
LPA	**0.15**	**0.08; 0.28**	**0.37**	**0.20; 0.69**	**0.26**	**0.15; 0.45**	**0.37**	**0.21; 0.65**	0.68	0.38; 1.20
MVPA	**0.07**	**0.04; 0.15**	**0.31**	**0.16; 0.59**	**0.13**	**0.07; 0.23**	**0.22**	**0.12; 0.39**	0.58	0.32; 1.06
Age	0.99	0.97; 1.01	0.98	0.96; 0.99	0.99	0.98; 1.01	0.99	0.98; 1.00	0.99	0.98; 1.00
BMI	1.03	0.99; 1.08	0.97	0.93; 1.02	1.02	0.98; 1.06	1.01	0.97; 1.05	0.97	0.93; 1.01
Sex	0.86	0.46; 1.59	0.85	0.52; 1.38	1.29	0.87; 1.92	1.16	0.79; 1.70	1.17	0.81; 1.70
Marital status	0.77	0.47; 1.27	1.31	0.86; 1.99	0.85	0.60; 1.22	0.95	0.67; 1.35	1.30	0.92; 1.83
Social responsibility	**3.47**	**1.78; 6.77**	**2.35**	**1.26; 4.38**	**2.84**	**1.63; 4.96**	1.63	0.92; 2.90	1.26	0.71; 2.25
Children at home	1.40	0.90; 2.18	0.77	0.55; 1.09	1.14	0.84; 1.55	1.02	0.76; 1.38	0.86	0.65; 1.14
Smoking	0.98	0.56; 1.71	1.21	0.77; 1.91	1.10	0.74; 1.64	1.02	0.69; 1.51	0.99	0.67; 1.46

Note. LPA = Light Physical Activity. MVPA = Moderate-to-Vigorous Physical Activity. BMI = Body Mass Index. Bold coefficients: $p < .05$.

Multinominal Regression Analyses with the "Resilient To Moderate Stress" Class as a Reference Group

Similar findings were observed when the "resilient to moderate stress" class was used as a reference group (Table 2): In the uncontrolled model (Model 1), participants who engaged in MVPA were significantly less likely than physically inactive individuals to be classified in the "highly burdened" (OR = 0.10), "stressed" (OR = 0.19), "moderately stressed" (OR = 0.33), and "resilient to high stress" (OR = 0.48) classes. No significantly differing likelihood was found for participants in the "low stress and healthy" class (OR = 1.60). Again, similar odds were found for participants who engaged in LPA, and the odds ratios remained almost unchanged after taking into consideration participants' social and demographic background (Model 2). With participants who are "resilient to moderate stress" as a reference group, responsibility towards relatives in need of care was associated with an increased likelihood of being classified in the "highly burdened" (OR = 2.74), "stressed" (OR = 2.25), and "resilient to high stress" classes (OR = 1.86). Being single was associated with an increased risk of being categorized in the "highly burdened" (OR = 0.60), "stressed" (OR = 0.66) and "moderately stressed" (OR = 0.74) classes. In addition, having children at home was associated with an increased risk of being a member of the "highly burdened" (OR = 1.64) and "stressed" (OR = 1.33) classes. Finally, having an increased BMI was linked to a slightly higher risk of being classified in the "highly burdened" (OR = 1.06), "stressed" (OR = 1.05), and "moderately stressed" (OR = 1.04) classes. Overall, these results indicate that the likelihood of being categorized into a class with less favourable stress and mental health profiles is higher among physically inactive participants. The findings also support that this risk is considerably decreased independent of whether participants engage in LPA or MVPA.

Multinominal Regression Analyses with the "Resilient To Moderate Stress" Class as a Reference Group

Similar findings were observed when the "resilient to moderate stress" class was used as a reference group (Table 2): In the uncontrolled model (Model 1), participants who engaged in MVPA were significantly less likely than physically inactive individuals to be classified in the "highly burdened" (OR = 0.10), "stressed" (OR = 0.19), "moderately stressed" (OR = 0.33), and "resilient to high stress" (OR = 0.48) classes. No significantly differing likelihood was found for participants in the "low stress and healthy" class (OR = 1.60). Again, similar odds were found for participants who engaged in LPA, and the odds ratios remained almost unchanged after taking into consideration participants' social and demographic background (Model 2). With participants who are "resilient to moderate stress" as a reference group, responsibility towards relatives in need of care was associated with an increased likelihood of being classified in the "highly burdened" (OR = 2.74), "stressed" (OR = 2.25), and "resilient to high stress" classes (OR = 1.86). Being single was associated with an increased risk of being categorized in the "highly burdened" (OR = 0.60), "stressed" (OR = 0.66) and "moderately stressed" (OR = 0.74) classes. In addition, having children at home was associated with an increased risk of being a member of the "highly burdened" (OR = 1.64) and "stressed" (OR = 1.33) classes. Finally, having an increased BMI was linked to a slightly higher risk of being classified in the "highly burdened" (OR = 1.06), "stressed" (OR = 1.05), and "moderately stressed" (OR = 1.04) classes. Overall, these results indicate that the likelihood of being categorized into a class with less favourable stress and mental health profiles is higher among physically inactive participants. The findings also support that this risk is considerably decreased independent of whether participants engage in LPA or MVPA.

Table 2

Odds Ratios Dependent on Self-Reported Physical Activity for Being Classified into a Specific Class with the "Resilient To Moderate Stress" Class as Reference Group

	Resilient to moderate stress vs.									
	... highly burdened		*... resilient to high stress*		*... stressed*		*... moderately stressed*		*... low stress and healthy*	
	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI	OR	95% CI
Model 1: Uncontrolled										
Physical activity										
Sedentary	1		1		1		1		1	
LPA	**0.19**	**0.12; 0.29**	**0.50**	**0.32; 0.78**	**0.33**	**0.23; 0.47**	**0.50**	**0.35; 0.72**	1.44	0.81; 2.55
MVPA	**0.10**	**0.06; 0.17**	**0.48**	**0.30; 0.76**	**0.19**	**0.13; 0.27**	**0.33**	**0.22; 0.48**	1.60	0.90; 2.85
Model 2: Controlled for social and demographic background										
Physical activity										
Sedentary	1		1		1		1		1	
LPA	**0.22**	**0.14; 0.35**	**0.55**	**0.35; 0.88**	**0.39**	**0.27; 0.55**	**0.55**	**0.38; 0.79**	1.48	0.83; 2.62
MVPA	**0.12**	**0.07; 0.22**	**0.53**	**0.33; 0.86**	**0.22**	**0.15; 0.33**	**0.37**	**0.25; 0.55**	1.72	0.95; 3.09
Age	1.00	0.98; 1.02	0.99	0.97; 1.00	1.00	0.99; 1.01	1.00	0.99; 1.01	1.01	0.99; 1.03
BMI	**1.06**	**1.01; 1.11**	1.00	0.96; 1.05	**1.05**	**1.02; 1.09**	**1.04**	**1.01; 1.08**	1.03	0.99; 1.08
Sex	0.73	0.41; 1.29	0.72	0.47; 1.10	1.10	0.80; 1.51	0.99	0.73; 1.34	0.85	0.59; 1.23
Marital status	**0.60**	**0.38; 0.94**	1.01	0.69; 1.46	**0.66**	**0.49; 0.89**	**0.74**	**0.55; 0.98**	0.77	0.55; 1.09
Social responsibility	**2.74**	**1.59; 4.73**	**1.86**	**1.14; 3.03**	**2.25**	**1.51; 3.35**	1.29	0.84; 1.98	0.79	0.44; 1.41
Children at home	**1.64**	**1.09; 2.45**	0.90	0.67; 1.21	**1.33**	**1.04; 1.71**	1.19	0.94; 1.51	1.17	0.88; 1.55
Smoking	0.99	0.60; 1.63	1.22	0.83; 1.80	1.10	0.81; 1.53	1.03	0.75; 1.40	1.01	0.69; 1.48

Note. LPA = Light Physical Activity. MVPA = Moderate-to-Vigorous Physical Activity. BMI = Body Mass Index. Bold coefficients: $p < .05$.