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The Associations between physical activity, sedentary behavior, and burnout

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Abstract

This study is one part of online research “The Food Mood Move project”. To examine the relations between different types of physical activity (PA), sedentary behavior (SB), and burnout syndrome and whether SB moderates the relation between PA and burnout syndrome. 251 18-74-year-olds (69.3% men, 30.3% women, and .4% other) adults were recruited for survey participation from different countries. Burnout and its four dimensions (exhaustion, mental distance, cognitive and emotional impairment) were measured through the Burnout Assessment Tool (BAT), and the Global Physical Activity Questionnaire (GPAQ) was used to measure three domains of PA (work, recreation, and travel) and SB. Binary logistic regression analyses were performed to investigate the relations. The results showed that, firstly, PA at work was negatively related to the risk of burnout syndrome (OR = .48, 95% CI = .26 – .88) and recreational PA (OR = .63, 95% CI = .41 – .98) was negatively associated with exhaustion. No relation between PA and cognitive impairment, mental distance, and emotional impairment was found. Secondly, SB was not related to burnout or its dimensions. Finally, SB did not moderate the relationship between PA and burnout or its dimensions. In summary, stimulating more PA at work and leisure time might play a significant role in preventing burnout. It is necessary to encourage a healthy lifestyle for workers.

Keywords: physical activity, sedentary behavior, burnout, exhaustion.

Introduction

Burnout, which leads to lower productivity and poor health outcomes, has been regarded as an occupational hazard for many years (Maslach & Leiter, 2016). While various definitions of burnout exist, this paper will use the definition suggested by Schaufeli et al. (2020), who considered burnout as a work-related syndrome with core and secondary symptoms. Four dimensions form the core of burnout: exhaustion, mental distance, cognitive and emotional impairment. Exhaustion is the principal component that describes feelings of loss of energy, both physically and mentally. Mental distance is characterized by a strong reluctance to work, such as in attitude, interest, and behavior. Cognitive impairment may be seen in difficulties such as memory, attention, and cognitive performance. Emotional impairment can lead to a person feeling overwhelmed in emotion and an inability to control one's emotions. Finally, secondary symptoms manifest as psychological distress, psychosomatic complaints, and depressed mood. This concept is different from a commonly used concept suggested by Maslach et al. (1997; 2001): Burnout is a syndrome encompassing three dimensions—exhaustion, cynicism, and inefficacy, in which cynicism is consistent with the concept of mental distance and inefficacy refers to reduced personal accomplishment. Schaufeli et al. (2020) argued that reduced accomplishment should be a consequence but not a dimension of burnout, whereas cognitive impairment should be identified as an essential element of burnout (Deligkaris et al., 2014; Jonsdottir et al., 2017). Burnout gives rise to negative physical, psychological and occupational consequences, such as cardiovascular diseases, depressive symptoms, and job dissatisfaction, highlighting the need to recognize and prevent burnout in an occupational environment (Salvagioni et al., 2017).

Existing systematic reviews suggest that increased PA may be effective in reducing the risk of burnout (Naczenski et al., 2017; Maslach & Leiter, 2016; Verhavert et al., 2020), whereas one meta-analysis (Ochentel et al., 2018) including four randomized controlled trials did not support the efficacy of exercise therapy in alleviating burnout symptoms. Likewise, SB could be a potential target to help prevent burnout. A systematic review (Rezende et al., 2014) has shown that SB may be an essential determinant of health, independently of PA. Two observational studies (Jonsdottir et al., 2010; Lindwall et al., 2012) found that more SB was linked to a higher risk of burnout. Another study (Bernaards et al., 2006) concluded that strenuous PA reduced more exhaustion in people with a sedentary job than in people without a sedentary job, indicating interactions between PA, SB, and risk of burnout.

Although it has already been suggested that PA and SB are associated with burnout, there are still a lot of things unclear. First of all, most previous studies assessed PA and SB's effect on total burnout syndrome or only the dimension of exhaustion. These studies showed consistent outcomes, but the evidence on other dimensions is limited or inconsistent. Two experimental studies (Gerber et al., 2013; Van Rhenen et al., 2005) found a negative relation between PA and mental distance, but one study (Freitas et al., 2014) did not. On the dimension of cognitive impairment, only two cross-sectional studies (Felez-Nobrega et al., 2020; Nemoto et al., 2018) suggested that increased PA was associated with a reduced risk for subjective cognitive complaints among the middle-aged and older adult, but this relation did not occur in younger age. Nemoto et al. (2018) also concluded that SB for reading was negatively related to subjective cognitive complaints among the older population. Secondly, few studies have checked the effect of different types of PA on burnout. A cross-sectional

study (Carson et al., 2010) suggested that work-related and leisure-time PA were negatively linked to emotional exhaustion. For PA during travel and other dimensions of burnout, it remains unknown whether these relationships occur.

Additionally, we need a more precise way to measure SB. Barnes et al. (2012, p. 540) suggested that SB should be defined as “any waking behavior characterized by an energy expenditure ≤ 1.5 METs (Metabolic Equivalent of Task) while in a sitting or reclining posture”. Earlier studies (Jonsdottir et al., 2010; Lindwall et al., 2012) confused the concepts of “SB” and “physical inactivity” (Verhavert et al., 2020) since articles (Barnes et al., 2012; Panahi & Tremblay, 2018) have argued that they are two different behaviors.

In summary, we need to combine and examine how SB and PA types are associated with burnout syndrome and its four dimensions. The present study aims to investigate the relations between PA, SB, and burnout. The above-presented arguments suggest the following hypotheses: 1) Higher levels of PA (domains at work, recreation, and travel) are associated with lower levels of burnout syndrome, exhaustion, mental distance, and emotional impairment (Hypothesis 1a), but not associated with cognitive impairment (Hypothesis 1b); 2) Higher SB levels are associated with higher levels of burnout syndrome, exhaustion, mental distance and emotional impairment (Hypothesis 2a). Higher SB levels are associated with lower levels of cognitive impairment (Hypothesis 2b); 3) Higher levels of SB strengthen the benefit of PA (domains at work, recreation, and travel) on burnout syndrome and exhaustion (Hypothesis 3a), but not on mental distance, cognitive and emotional impairment (Hypothesis 3b).

Methods

Participants

This study is one part of online research “The Food Mood Move project,” which examines how lifestyle influences mood. Participants from different countries, such as the Netherlands, China, and Germany, were recruited through social (media) networks. They answered the questionnaire in the selected language (English, Dutch, Chinese, or German). Only respondents who met the following criteria were included in this study (n=251): a) complete data for study variables, b) adults at employment, including students. The Ethics Committee of the Faculty of Social and Behavioural Sciences of Utrecht University approved this study (20-0096), and all participants signed an informed consent form before participation.

Measurements

The Burnout Assessment Tool (BAT) (Schaufeli et al., 2020) was used to assess burnout and its dimensions by obtaining a total score and four sub-scores. In this scale, work refers to all structured and goal-directed activities, which means students who also suffer from burnout can fill out this questionnaire but not those who keep the house (Schaufeli, 2018). There are two versions of the BAT: work-related version and general version. The general version is designed to assess those who are currently not working due to sick leave or other reasons since they cannot answer questions like “I feel tired at the end of my working day”. Both versions of BAT have been demonstrated satisfactory reliability and validity. The question “Have you been temporarily absent from work for a month due to sick leave or other reasons?” was designed to distinguish which version of the BAT the subject will use. The

BAT contains 23 items (22 items in general version) regarding the core elements of burnout: exhaustion (e.g., “Everything I do at work requires a great deal of effort”), mental distance (e.g., “I feel a strong aversion towards my job”), cognitive impairment (e.g., “I have trouble staying focused”), and emotional impairment (e.g., “I get upset or sad without knowing why”). The participants rated the agreement level on a 5-point Likert scale ranging from 1 (never) to 5 (always). Obtained mean scores of indexes of burnout syndrome and four dimensions were classified into two categories (not at risk and at risk) based on suggested cut-off values (Schaufeli et al., 2019): 2.58 (total-score), 3.05 (exhaustion), 2.49 (mental distance), 2.69 (cognitive impairment) and 2.09 (emotional impairment).

The Global Physical Activity Questionnaire (GPAQ) (Armstrong & Bull, 2006) was used to measure PAs and SB. This scale asked participants to complete 15 questions regarding the duration of time (expressed in hours and minutes) of three PA domains: work, travel to and from places, and recreation (e.g., “In a typical week, on how many days do you do moderate-intensity activities as part of your work?”, “How much time do you spend doing moderate-intensity activities at work on a typical day?”). One item “How much time do you usually spend sitting or reclining on a typical day?” to assess SB. Participants reported their time spent on PA in a typical week and SB on a typical day. For analysis purposes, mean scores of time spent in minutes on a typical day were obtained: moderate to vigorous PA at work, PA during travel, moderate to vigorous recreational PA, and SB. The obtained data was cleaned according to the analysis guide of GPAQ.

Data analysis

IBM SPSS Statistics for Windows (Version 26) was applied to test the hypotheses

and calculate descriptive statistics. Binary logistic regression analyses were conducted to evaluate how SB and different types of PA are associated with burnout syndrome and its dimensions. The analysis of each outcome was adjusted by age, gender, education, marital status, Body Mass Index (BMI), and work hours. Obtained odds ratio (OR) and the corresponding 95% confidence interval (CI) are presented.

To check whether SB moderates the linkages between different PAs and burnout (total and its dimensions), the PROCESS macro for SPSS (Version 3.5) was used. Potential interactions between PAs and SB were checked in the adjusted models. The interaction terms remained in the adjusted models only if its P values are $< .05$, and there is a significant difference between the model with the interaction term and the main effects model (adjusted model) (Zhang, 2016).

Results

Descriptive statistics

The characteristics of the study population are reported in Table 1. A total of 251 participants had complete data. 51.0% of respondents included were living in The Netherlands, 36.3% were in China, 10.8% were in Germany, and 2.0% were in other countries. The majority of them were 18 – 24 years old (42.2%) and female (69.3%) and held a college or university degree (59.8%). Of all respondents, 44.2% were employed full time, 38.2% were students, 10.4% were employed part-time, and 7.2% were self-employed. Table 2 shows descriptive statistics for study variables. The minutes of SB ($M = 512.81$, $SD = 211.54$) and PA per day: work ($M = 24.91$, $SD = 84.26$), travel ($M = 26.96$, $SD = 33.58$) and recreation ($M = 38.24$, $SD = 52.68$) were reported. Based on the cut-off scores for the

BAT, about 25.5% of participants identified as being at risk of burnout.

Table 3 shows the variables and results of logistic regressions for each outcome of the adjusted models. The findings were partly following predefined Hypotheses 1, 2, and 3.

PAs, SB, and burnout syndrome

PA at work was negatively related to burnout syndrome. The odds ratio for PA at work indicated that when the confounders were taken into account, each one-point increase in PA at work was related to a 0.48-fold decrease (95% CI, .26 – .88) in the likelihood of risk of burnout. However, there was no significant association with SB, PA for recreation and travel to burnout syndrome.

PAs, SB, and exhaustion

Recreational PA was negatively related to exhaustion: each one-point increase in recreational PA was related to a 0.63-fold decrease (95% CI, .41 – .98) in the likelihood of risk of exhaustion. However, SB, PA at work and during travel was not associated with exhaustion.

PAs, SB and mental distance / cognitive impairment / emotional impairment

All types of PA and SB were not related to mental distance, cognitive impairment, and emotional impairment.

SB as a moderating variable in PA and burnout relation

No significant moderating effects of SB on PA and burnout relation were found. We checked the SB's moderate roles on the relationship between PA at work and burnout syndrome and the relationship between recreational PA and exhaustion. When the interaction term for SB and PA at work was added in the adjusted model for burnout syndrome, the

interaction was not significant (OR = .84; 95% CI, 0.55 – 1.26). Similarly, the interaction term for SB and creational PA (OR = .90; 95% CI, 0.59 – 1.35) was not significant in the adjusted model for exhaustion. No significant difference was found between the model with the interaction term and the main effects model. Thus, the interaction terms were not included in the adjusted models.

Discussion

The primary goal of this study is to examine the associations between different types of PA, SB, and burnout and to examine whether SB moderates the relationship between PA and burnout. The findings are essential since lifestyle changes are cost-effectively and accessible ways to reduce the risk of burnout. The obtained results only partially confirm the initial assumptions.

We first examined the relationship between PA types and burnout syndrome. Burnout syndrome was measured by a total index containing four core dimensions in this study. The finding suggests that only PA at work instead of other PA types is negatively related to the risk of burnout syndrome, partially supporting Hypothesis 1. When investigating the relationship between PA and burnout syndrome, prior studies only measured PA as a whole without distinguishing between PA at work. Observational studies (Jonsdottir et al., 2010; Lindwall et al., 2014; Moueleu Ngalagou et al., 2019) suggested that more moderate-to-vigorous PA was associated with fewer burnout symptoms. However, the present study's result is inconsistent with previous studies that suggested that active recreational PA was related to a reduced risk of burnout. Randomized controlled trials (RCTs) (Gerber et al., 2013; Heiden et al., 2007; Lindegård et al., 2015; Tsai et al., 2013) found lower levels of

burnout were reported after interventions adopting recreational PA such as swimming, walking, gymnastics or aerobic exercise. Another longitudinal study (Toker & Biron, 2012) concluded strenuous PA during leisure time and burn-out are negatively correlated. One reason for the unexpected result could be the different concept of burnout used in this study. Previous studies measured burnout using scales with varied constructions of burnout based on different dimensions, including the Maslach Burnout Inventory (Maslach & Jackson, 1981), the Shirom-Melamed Burnout Questionnaire (Melamed et al., 1992), and the Copenhagen Burnout Inventory (Kristensen et al., 2005). For example, the Shirom-Melamed Burn-out Questionnaire defines burnout as a syndrome of exhaustion (physically and emotionally), cognitive weariness, and tension, in which mental distance is excluded.

The relations of PA types to four dimensions of burnout were also explored in the present study. The results partially supported Hypothesis 1. Firstly, the results showed that recreational PA, but not PA at work or during travel, was negatively associated with exhaustion. This finding is partly in line with earlier studies. The effect of recreational PA on exhaustion has been confirmed by experimental studies (Dreyer et al., 2012; Gerber et al., 2013; Vries et al., 2017) and cross-sectional study (Ahola et al., 2012). Recreational PA improves sleep (Farnsworth et al., 2015) and stimulates recovery by providing the fatigued workers with the opportunity to disconnect from work (Sonnentag, 2012). On the other hand, a cross-sectional study conducted by Carson et al. (2010) revealed that workplace and leisure-time PA were negatively associated with exhaustion. The finding from this study, however, does not suggest that PA at work is related to exhaustion. This discrepancy in results may be due to the difference in samples. The main subjects of the study of Carson et al. were

childcare teachers, but the group in this study consisted of several employment types, such as students and part-time workers. One cross-sectional study (White et al., 2020) concluded that occupation significantly moderated the relation between work-related physical activity and psychological distress. Since psychological distress may be a precursor to exhaustion (Arvidsdotter et al., 2016), this result implied that the relationship between work-related physical activity and exhaustion might vary across occupational types, but more future research is needed to explore this.

Secondly, PA types were not related to mental distance, which is partially following the former studies. Some studies (Ahola et al., 2012; Alexandrova-Karamanova et al., 2016; Gerber et al., 2013; Van Rhenen et al., 2005) found a negative association between PA and mental distance. Gerber et al. (2013) argued that reducing mental distance may be attributed to increased personal and social resources during engagement in PA. In contrast, findings from the present study did not support this idea, which is consistent with the results from an experimental study (Freitas et al., 2014) and a cross-sectional study (Peterson et al., 2008).

Finally, the result of the present study partly did not confirm the association between PA and cognitive impairment, which confirmed Hypothesis 1b. The main population (84.5%) from the present study was 18-44 years old, and the result of our study is consistent with a cross-sectional study (Felez-Nobrega et al., 2020), as they concluded that the negative relation between PA and subjective cognitive complaints was observed in adults aged ≥ 45 years and no significant relation was found in those who aged 18-44 years. These findings suggest that PA may be helpful in improving subjective cognitive function in older adults but not in younger adults. Furthermore, no relationship between PA and emotion impairment was

found in this study.

Next, we aim to check how SB is related to burnout and its dimensions. The findings did not support the relationship between SB and burnout or four dimensions. Hypothesis 2a and 2b were rejected. This result is inconsistent with previous studies. Two observational studies suggested the positive association between SB and burnout syndrome (Jonsdottir et al., 2010; Lindwall et al., 2012). The inconsistent may be due to these two studies confused SB with “physical inactivity” in measurement. They considered people with the lowest level of PA to be sedentary by using the 4-level Saltin Grimby Physical Activity Level Scale (Grimby et al., 2015) without actually assessing the level of SB. However, physical inactivity and SB are two distinct concepts and represent separate risk factors for diseases (Barnes et al., 2012). Besides, a cross-sectional study (Nemoto et al., 2018) found that time spent on SB while reading, not while watching TV, was associated with a reduced risk for subjective cognitive complaints among adults aged over 65 years. The reason why we did not find the positive relationship between SB and cognition function may be the difference in the study group and measurement of SB: nearly 90% of the sample in this study was aged 18-54 years, and SB was measured including all types of sitting (such as watching TV, reading and traveling in a car).

At last, moderating roles of SB on the relations between different domains of PA and burnout and its dimensions were investigated. Surprisingly, the moderating role of SB was not supported by the data from this study. Hypothesis 3a was rejected, and Hypothesis 3b was accepted. This result is inconsistent with the study conducted by Bernaards et al. (2006), who concluded that the negative relationship between strenuous leisure-time physical activity and

the risk of emotional exhaustion was exacerbated in workers with a sedentary job. The different settings in SB may contribute to this inconsistency. Bernaards et al. identified SB according to whether workers are sitting during most of the workday. However, the present study measured SB combining SB at work and leisure time rather than separately. Further study may divide SB into different types, such as work-related and leisure-time sitting, to check the moderating effect.

Overall, despite only partially supporting early studies, the findings suggest that PA at work and recreational PA are associated with burnout. There are several explanations for the discrepant results found in this study. At first, the conceptualization of burnout in this study differs from the concepts of burnout in previous. For example, only two dimensions (exhaustion and mental distance) for burnout are shared between the concept in BAT (Schaufeli et al., 2020) and the widely used definition suggested by Maslach et al. (2001). Thus, when comparing the present results with the results from previous research, we should be aware of this discrepancy. The second reason is that the sample in this study is different. Previous studies have primarily investigated full-time workers, excluding students, whereas the present study adopted a broader definition of work, and 38.2% of participants were students. Lastly, the COVID-19 outbreak may potentially influence the study results by acting as a confounding variable. People have changed their working life from on-site to online because of home confinement, which negatively impacts PA and SB (Ammar et al., 2020). It is also anticipated that the COVID-19 pandemic may affect people's burnout levels, as many people lost their jobs, increased their workload and exposure to workplace stressors, or changed the way they worked during this particular period. Considering that this study's data

was collected during November and December 2020, the findings of the relationship between PA, SB, and burnout may also be confounded with the influence of the COVID-19 pandemic.

The results of the study show the importance of motivating exhausted workers to maintain a physically active lifestyle since experimental studies have reported that even the physical activity of 50-120 mins per week could already result in benefits of reducing the risk of burnout (Freitas et al., 2014; Tsai et al., 2013). A significant strength of the present study is that a validated questionnaire (GPAQ) was used to measure PA and SB. GAPQ collects information on PA covered full aspects of life, and SB distinguished from physical inactivity. Another advantage is a relatively diverse sample, which helps raise the possibility of generalizability. The participants comprised of individuals who are from different cultural backgrounds, ages, employment, and marital status.

However, there are certain limitations of this study worth noting. Firstly, the cross-sectional design is limited by drawing any causal conclusions of physical activity or SB on burnout. Moreover, the data were collected by subjective self-report methods, which could be affected by response biases (Podsakoff et al., 2012). Additionally, the study participants are characterized by a relatively high education level and a healthy mental state, making it difficult to generalize the results to lower socio-economic or clinical populations. Finally, further study is needed to understand the full picture of the relationship between the three study variables. We only examined the one-directional effect of PA or SB on burnout. A longitudinal study (Vries et al., 2016) confirmed the reciprocal relations between PA and exhaustion: people who are in physical inactivity related to a higher risk of exhaustion and more being tired from work were related to less PA engagement. This bidirectional relation

leads to a vicious cycle resulting in higher levels of exhaustion. A higher level of burnout may also relate to more SB, as it may be expected that exhausted workers spend more time sitting because of lacking energy. Another cross-sectional study (Feldman et al., 2003) suggested that students who spend long hours sitting for work in their part-time were more likely to engage in PA. These mentioned studies underlined the complicated relationship between PA, SB, and burnout. More research is needed in the future to investigate the bidirectional or causal relationships between these variables.

To conclude, the present study reveals positive associations of PA on reducing the risk of burnout, highlighting the importance of developing a healthy lifestyle with more exercise for workers. SB lifestyle is not correlated with burnout. Future research should apply longitudinal designs or controlled laboratory settings to understand the causal relations between PA, SB, and burnout better.

References

- Ahola, K., Pulkki-Råback, L., Kouvonen, A., Rossi, H., Aromaa, A., & Lönnqvist, J. (2012). Burnout and behavior-related health risk factors: Results from the population-based Finnish Health 2000 study. *Journal of Occupational and Environmental Medicine*, 54(1), 17–22. <https://doi.org/10.1097/JOM.0b013e31823ea9d9>
- Alexandrova-Karamanova, A., Todorova, I., Montgomery, A., Panagopoulou, E., Costa, P., Baban, A., Davas, A., Milosevic, M., & Mijakoski, D. (2016). Burnout and health behaviors in health professionals from seven European countries. *International Archives of Occupational and Environmental Health*, 89(7), 1059–1075. <https://doi.org/10.1007/s00420-016-1143-5>
- Arvidsdotter, T., Marklund, B., Kylén, S., Taft, C., & Ekman, I. (2016). Understanding persons with psychological distress in primary health care. *Scandinavian journal of caring sciences*, 30(4), 687–694. <https://doi.org/10.1111/scs.12289>
- Armstrong, T. & Bull, F. (2006). Development of the World Health Organization Global Physical Activity Questionnaire (GPAQ). *J Public Health*, 14(2), 66–70. <https://doi.org/10.1007/s10389-006-0024-x>
- Barnes, J., Behrens, T. K., Benden, M. E., Biddle, S., Bond, D., & Brassard, P. (2012). Letter to the editor: Standardized use of the terms “sedentary” and “sedentary behaviours”. *Appl. Physiol. Nutr. Metab.*, 37(3), 540–542. <https://doi.org/10.1139/h2012-024>
- Bernaards, C. M., Jans, M. P., van den Heuvel, S. G., Hendriksen, I. J., Houtman, I. L., & Bongers, P. M. (2006). Can strenuous leisure time physical activity prevent psychological complaints in a working population?. *Occupational and environmental*

medicine, 63(1), 10–16. <https://doi.org/10.1136/oem.2004.017541>

Carson, R. L., Baumgartner, J. J., Matthews, R. A., & Tsouloupas, C. N. (2010). Emotional exhaustion, absenteeism, and turnover intentions in childcare teachers: Examining the impact of physical activity behaviors. *Journal of Health Psychology*, 15(6), 905–914. <https://doi.org/10.1177/1359105309360697>

Deligkaris, P., Panagopoulos, E., Montgomery, A., & Masoura, E. (2014). Job burnout and cognitive functioning: A systematic review. *Work & Stress*, 28(2), 107–123. <https://doi.org/10.1080/02678373.2014.909545>

Dreyer, S., Dreyer, L., & Rankin, D. (2012). Effects of a 10-week High-Intensity Exercise Intervention on College Staff with Psychological Burnout and Multiple Risk Factors. *Journal of Research*, 7(1), 27–33.

Farnsworth, J. L., Kim, Y., & Kang, M. (2015). Sleep Disorders, Physical Activity, and Sedentary Behavior Among U.S. Adults: National Health and Nutrition Examination Survey. *Journal of Physical Activity & Health*, 12(12), 1567–1575. <https://doi.org/10.1123/jpah.2014-0251>

Feldman, D. E., Barnett, T., Shrier, I., Rossignol, M., & Abenhaim, L. (2003). Is Physical Activity Differentially Associated With Different Types of Sedentary Pursuits? *Archives of Pediatrics & Adolescent Medicine*, 157(8), 797–802. <https://doi.org/10.1001/archpedi.157.8.797>

Felez-Nobrega, M., Haro, J. M., Erickson, K. I., & Koyanagi, A. (2020). Physical Activity is Associated with Fewer Subjective Cognitive Complaints in 47 Low- and Middle-Income Countries. *Journal of the American Medical Directors Association*, 21(10),

1423-1429.e2. <https://doi.org/10.1016/j.jamda.2020.02.014>

Freitas, A. R., Carneseca, E. C., Paiva, C. E., & Paiva, B. S. R. (2014). Impact of a physical activity program on the anxiety, depression, occupational stress and burnout syndrome of nursing professionals. *Revista Latino-Americana De Enfermagem*, 22(2), 332–336.

<https://doi.org/10.1590/0104-1169.3307.2420>

Gerber, M., Brand, S., Elliot, C., Holsboer-Trachsler, E., Pühse, U., & Beck, J. (2013).

Aerobic exercise training and burnout: A pilot study with male participants suffering from burnout. *BMC Research Notes*, 6, 78. <https://doi.org/10.1186/1756-0500-6-78>

Grimby, G., Börjesson, M., Jonsdottir, I. H., Schnohr, P., Thelle, D. S., & Saltin, B. (2015).

The “Saltin-Grimby Physical Activity Level Scale” and its application to health research. *Scandinavian Journal of Medicine & Science in Sports*, 25 Suppl 4, 119–125. <https://doi.org/10.1111/sms.12611>

PROCESS macro for SPSS (Version 3.5) [Computer software]. (2020). Hayes A. F.

<https://processmacro.org/index.html>

Heiden, M., Lyskov, E., Nakata, M., Sahlin, K., Sahlin, T., & Barnekow-Bergkvist, M.

(2007). Evaluation of cognitive behavioural training and physical activity for patients with stress-related illnesses: A randomized controlled study. *Journal of Rehabilitation Medicine*, 39(5), 366–373. <https://doi.org/10.2340/16501977-0053>

IBM SPSS Statistics for Windows (Version 26.0) [Computer software]. (2019). IBM Corp.

Armonk, NY: IBM Corp. <https://www.ibm.com/>

Jonsdottir, I. H., Rödger, L., Hadzibajramovic, E., Börjesson, M., & Ahlborg, G. (2010). A

prospective study of leisure-time physical activity and mental health in Swedish

- health care workers and social insurance officers. *Preventive Medicine*, 51(5), 373–377. <https://doi.org/10.1016/j.ypmed.2010.07.019>
- Jonsdottir, I. H., Nordlund, A., Ellbin, S., Ljung, T., Glise, K., Währborg, P., Sjörs, A., & Wallin, A. (2017). Working memory and attention are still impaired after three years in patients with stress-related exhaustion. *Scandinavian Journal of Psychology*, 58(6), 504–509. <https://doi.org/10.1111/sjop.12394>
- Kristensen, T. S., Borritz, M., Villadsen, E., & Christensen, K. B. (2005). The Copenhagen Burnout Inventory: A new tool for the assessment of burnout. *Work & Stress*, 19(3), 192–207. <https://doi.org/10.1080/02678370500297720>
- Lindegård, A., Jonsdottir, I. H., Börjesson, M., Lindwall, M., & Gerber, M. (2015). Changes in mental health in compliers and non-compliers with physical activity recommendations in patients with stress-related exhaustion. *BMC Psychiatry*, 15, 272. <https://doi.org/10.1186/s12888-015-0642-3>
- Lindwall, M., Ljung, T., Hadžibajramović, E., & Jonsdottir, I. H. (2012). Self-reported physical activity and aerobic fitness Self-reported physical activity and aerobic fitness are differently related to mental health. *Mental Health and Physical Activity*, 5, 28–34. <https://doi.org/10.1016/j.mhpa.2011.12.003>
- Lindwall, M., Gerber, M., Jonsdottir, I. H., Börjesson, M., & Ahlborg, G. (2014). The relationships of change in physical activity with change in depression, anxiety, and burnout: A longitudinal study of Swedish healthcare workers. *Health Psychol*, 33(11), 1309–1318. <https://doi.org/10.1037/a0034402>
- Maslach, C., & Jackson, S. E. (1981). The measurement of experienced burnout. *Journal of*

- Organizational Behavior*, 2(2), 99–113. <https://doi.org/10.1002/job.4030020205>
- Maslach, C., Jackson, S. E., & Leiter, M. P. (1997). Maslach Burnout Inventory: Third Edition. *Palo Alto, CA: Consulting Psychologists Press*, 3, 191–218.
- Maslach, C., Wilmar B. Schaufeli, & Michael P. Leiter (2001). JOB BURNOUT. *Annu. Rev. Psychol*, 52, 397–422. <https://doi.org/10.1146/annurev.psych.52.1.397>
- Maslach, C., & Leiter, M. P. (2016). Understanding the burnout experience: recent research and its implications for psychiatry. *World psychiatry: official journal of the World Psychiatric Association (WPA)*, 15(2), 103–111. <https://doi.org/10.1002/wps.20311>
- Melamed, S., Kushnir, T., & Shirom, A. (1992). Burnout and risk factors for cardiovascular diseases. *Behavioral Medicine (Washington, D.C.)*, 18(2), 53–60.
<https://doi.org/10.1080/08964289.1992.9935172>
- Moueleu Ngalagou, P. T., Assomo-Ndemba, P. B., Owona Manga, L. J., Owoundi Ebolo, H., Ayina Ayina, C. N., Lobe Tanga, M.-Y., Guessogo, W. R., Mekoulou Ndongo, J., Temfemo, A., & Mandengue, S. H. (2019). Burnout syndrome and associated factors among university teaching staff in Cameroon: Effect of the practice of sport and physical activities and leisures. *L'encephale*, 45(2), 101–106.
<https://doi.org/10.1016/j.encep.2018.07.003>
- Naczenski, L. M., Vries, J. D., Hooff, M., & Kompier, M. (2017). Systematic review of the association between physical activity and burnout. *Journal of occupational health*, 59(6), 477–494. <https://doi.org/10.1539/joh.17-0050-RA>
- Nemoto, Y., Sato, S., Takahashi, M., Takeda, N., Matsushita, M., Kitabatake, Y., Maruo, K., & Arao, T. (2018). The association of single and combined factors of sedentary

- behavior and physical activity with subjective cognitive complaints among community-dwelling older adults: Cross-sectional study. *PloS one*, *13*(4), e0195384. <https://doi.org/10.1371/journal.pone.0195384>
- Ochentel, O., Humphrey, C., & Pfeifer, K. (2018). Efficacy of Exercise Therapy in Persons with Burnout. A Systematic Review and Meta-Analysis. *Journal of sports science & medicine*, *17*(3), 475–484.
- Panahi, S., & Tremblay, A. (2018). Sedentariness and Health: Is Sedentary Behavior More Than Just Physical Inactivity? *Front. Public Health*, *6*, 258. <https://doi.org/10.3389/fpubh.2018.00258>
- Podsakoff, P. M., MacKenzie, S. B., & Podsakoff, N. P. (2012). Sources of Method Bias in Social Science Research and Recommendations on How to Control It. *Annual Review of Psychology*, *63*(1), 539–569. <https://doi.org/10.1146/annurev-psych-120710-100452>
- Rezende, L. F. M. de, Rodrigues Lopes, M., Rey-López, J. P., Matsudo, V. K. R., & Luiz, O. d. C. (2014). Sedentary behavior and health outcomes: An overview of systematic reviews. *PloS One*, *9*(8), e105620. <https://doi.org/10.1371/journal.pone.0105620>
- Salvagioni, D. A. J., Melanda, F. N., Mesas, A. E., González, A. D., Gabani, F. L., & Andrade, S. M. d. (2017). Physical, psychological and occupational consequences of job burnout: A systematic review of prospective studies. *PloS One*, *12*(10), e0185781. <https://doi.org/10.1371/journal.pone.0185781>
- Schaufeli, W. B. (2018). Burnout: feiten en fictie [Burnout: Facts and fiction]. *De Psycholoog*, *53*(9), 10–20. <https://doi.org/10.3389/fpubh.2018.00258>

Schaufeli, W. B., De Witte, H. & Desart, S. (2019). User Manual – Burnout Assessment Tool (BAT) – Version 2.0. *KU Leuven, Belgium: Internal report.*

Schaufeli, W. B., Witte, H. de, & Desart, S. (2020). Manual Burnout Assessment Tool (BAT) – Version 2.0. *KU Leuven, Belgium: Unpublished Internal Report.*

Sonnentag, S. (2012). Psychological Detachment From Work During Leisure Time. *Current Directions in Psychological Science*, 21(2), 114–118.

<https://doi.org/10.1177/0963721411434979>

Toker, S., & Biron, M. (2012). Job burnout and depression: Unraveling their temporal relationship and considering the role of physical activity. *The Journal of Applied Psychology*, 97(3), 699–710. <https://doi.org/10.1037/a0026914>

Tsai, H. H., Yeh, C. Y., Su, C. T., Chen, C. J., Peng, S. M., & Chen, R. Y. (2013). The effects of exercise program on burnout and metabolic syndrome components in banking and insurance workers. *Industrial Health*, 51(3), 336–346.

<https://doi.org/10.2486/indhealth.2012-0188>

Van Rhenen, W., Blonk, R. W., van der Klink, J. J., van Dijk, F. J., & Schaufeli, W. B. (2005). The effect of a cognitive and a physical stress-reducing programme on psychological complaints. *International archives of occupational and environmental health*, 78(2), 139–148. <https://doi.org/10.1007/s00420-004-0566-6>

Verhavert, Y., Martelaer, K. de, van Hoof, E., van der Linden, E., Zinzen, E., & Deliëns, T. (2020). The Association between Energy Balance-Related Behavior and Burn-Out in Adults: A Systematic Review. *Nutrients*, 12(2), 397.

<https://doi.org/10.3390/nu12020397>

- Vries, J. D. de, Claessens, B. J. C., van Hooff, M. L. M., Geurts, S. A. E., van den Bossche, S. N. J., & Kompier, M. A. J. (2016). Disentangling longitudinal relations between physical activity, work-related fatigue, and task demands. *International Archives of Occupational and Environmental Health*, 89(1), 89–101.
<https://doi.org/10.1007/s00420-015-1054-x>
- Vries, J. D. de, van Hooff, M. L., Guerts, S. A., & Kompier, M. A. (2017). Exercise to reduce work-related fatigue among employees: A randomized controlled trial. *Scandinavian Journal of Work, Environment & Health*, 43(4), 337–349.
<https://doi.org/10.5271/sjweh.3634>
- White, R. L., Bennie, J., Abbott, G., & Teychenne, M. (2020). Work-related physical activity and psychological distress among women in different occupations: a cross-sectional study. *BMC public health*, 20(1), 1007. <https://doi.org/10.1186/s12889-020-09112-7>
- Zhang, Z. (2016). Model building strategy for logistic regression purposeful selection. *Annals of Translational Medicine*, 4(6), 111. <https://doi.org/10.21037/atm.2016.02.15>

Table 1*Characteristics of Study Population*

Variables	n	%	M	SD
Age				
18-24	106	42.2		
25-34	81	32.3		
35-44	25	10.0		
45-54	26	10.4		
55-64	12	4.8		
65-74	1	.4		
Gender				
Female	174	69.3		
Male	76	30.3		
Other	1	.4		
Country (current living)				
The Netherlands	128	51.0		
China	91	36.3		
Germany	27	10.8		
Others	5	2.0		
Language				
Dutch	112	44.6		
Chinese	95	37.8		
German	26	10.4		
English	18	7.2		
Educational Level				
High school diploma	51	20.3		
College degree	150	59.8		
Master's degree	48	19.1		
Doctorate (Ph.D. equivalent)	2	.8		
Marital Status				
Single	77	30.7		
In a relationship, but not living together	67	26.7		
Living together	20	8.0		
Married	78	31.1		
Divorced	9	3.6		
Employment				
Student	96	38.2		
Self-employed	18	7.2		
Working, full-time	111	44.2		
Working, part-time	26	10.4		

Variables	n	%	M	SD
Work hours/week				
< 32 hours	81	32.3		
32-39 hours	94	37.5		
40-48 hours	51	20.3		
> 48 hours	25	10.0		
Use of psychotropic medications				
Yes	8	3.2		
No	243	96.8		
Absent from work				
Yes	28	11.2		
No	223	88.8		
BMI			22.55	3.65

NOTE. N = 251. BMI= Body Mass Index.

Table 2

Descriptive statistics for study variables

Study variables	n	%	M	SD	Min	Max
Physical activity (Mins / Day)						
Work			24.91	84.26	.00	685.71
Travel			38.24	52.68	.00	497.14
Recreation			26.96	33.58	.00	180.00
Sedentary behavior (Mins / Day)			512.81	211.54	.00	1200.00
Burnout (total)						
Not at risk	187	74.5				
At risk	64	25.5				
Exhaustion						
Not at risk	210	83.7				
At risk	41	16.3				
Mental distance						
Not at risk	189	75.3				
At risk	62	24.7				
Cognitive impairment						
Not at risk	182	72.5				
At risk	69	27.5				
Emotional impairment						
Not at risk	163	64.9				
At risk	88	35.1				

NOTE. N = 251.

Table 3

Adjusted models demonstrating odds ratios for physical activity and sedentary behavior in predicting burnout and its dimensions.

Predictor	Burnout syndrome			Exhaustion			Mental distance			Cognitive impairment			Emotional impairment		
	OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI		OR	95% CI	
		LL	UL		LL	UL		LL	UL		LL	UL		LL	UL
Physical activity															
Work	.48*	.26	.88	.81	0.51	1.29	.69	0.48	1.00	.72	0.49	1.03	.81	0.60	1.10
Travel	1.05	0.73	1.51	.62	0.38	1.03	1.18	0.83	1.69	1.04	0.73	1.48	1.09	0.80	1.49
Recreation	.81	0.56	1.17	.63*	.41	.98	.93	0.67	1.30	.90	0.65	1.25	.87	0.65	1.16
Sedentary behaviour															
	.77	0.54	1.10	1.05	0.68	1.60	.73	0.51	1.05	.87	0.62	1.23	.87	0.64	1.18

NOTE. All analyses were adjusted for age, gender, education, marital status, Body Mass Index (BMI), and work hours.

CI = confidence interval; LL = lower limit; UL = upper limit.

* $p < .05$