The association between job-related psychological strain and mental health

Master Thesis Health Economics

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Abstract

Occupation and work are regarded as important factors influencing the mental health of people. Although previous research has been conducted on the effects of job-related stressors on work, most studies focused on either the effects of physical workload or the effect of stressors within a certain job industry. This research analyses the effects of psychological job-related stressors on mental health care use, using the information on stressors across 67 different industries and tied to panel data on mental health care use and expenditures of the Dutch population from 2010 until 2016. This is done by using a fixed effects model with control variables on age and physical workload. This helps taking part of selection into account. Contrary to most literature, this study finds some proof that work pressure by itself has no effect on the mental health care use of employees. A precise zero is found for the effect of work pressure on the total mental health care use of individuals. Additionally, there is no evidence found on work pressure affecting the mental health care expenditures of individuals. Next to this, working in an industry with more autonomy seems to lead to higher mental health care utilization by employees. Finally, the combination of high work pressure and high autonomy appear to lead to a worsening mental health, on the contrary to Karasek's demand-control model.

Table of Contents

Introduction

According to a research initiated by the World Economic Forum, mental health conditions accounted for a total global cost of US$2.5 trillion in 2010 for society. These costs are projected to increase to US$6.0 trillion by 2030, two-thirds of which are indirect costs due to productivity losses and disability (Bloom, et al., 2012).

The prevalence of mental health problems in combination with the associated economic costs, poses a real problem on a societal level as well as for firms and employers. With the current trend of increased health expenditures over time (Organisation for Economic Co-operation and Development, 2018), it would be beneficial to research the causes of mental health issues.

Research suggests that occupation and work are key factors regarding the mental health of people (Bluestein, 2008; Yong & Yue, 2007). Longer periods of work-related stress may cause serious negative effects on the mental health of employees, under which an increased risk of burnouts, medical issues and sick leave. Thus, the worsening mental health of employees expresses itself on the work floor as loss of productivity.

As shown in various studies, this worsening mental health causes a loss in productivity. The research of Boles, Pelletier, & Lynch (2004) show that presenteeism — defined as impairment on the job leading to lower productivity and delivering below-normal work quality — is most significant for workers who experience high amounts of stress. This link between mental health and productivity is also supported by the research of McTernan, Dollard, & LaMontagne (2013). They find that job strain is associated with depression, leading to lower productivity due sickness absence and presenteeism.

Although previous research has analysed the relation between psychological strain of the occupation and mental health of workers, this was mainly focused on researching employees within the same occupation. Payne & Fletcher (1983) find limited effects of work pressure and job strain affecting the psychological well being of schoolteachers, while Bourbonnais, Comeau, & Vézina (1999) identified that psychological strain has some association with psychological problems amongst nurses. There is thus limited research on the effect of psychological stressors on the use of mental health care between different occupations. This research aims to contribute several things to the existing literature.

The goal of this research is to estimate the effects of job-related psychological stressors on the mental health care use of employees. On the one hand, this study examines the effects across industries, whereas previous papers did not. On the other hand, this research complements other papers that assess the effects of occupation on health with a main focus on the effect of physical workload on health. Manual workers are found to have higher mortality rates as compared to non-manual workers

(Cutler, Lleras-Muney, & Vogl, 2008; Mackenbach, et al., 2003). However, the psychological stressors were not addressed in these papers.

The aim of this study is quite similar to previous research of Ravesteijn, Van Kippersluis, & Van Doorslaer (2018). The current paper analyses the effects of both physical aspects and psychological aspects of work stressors and provide a solid base for identifying the effects of these stressors on health. Ravesteijn et al. find that there is a health gap with an effect comparable to aging 29 months between blue- and white-collar workers due to differences in physical workload and job control.

However, a significant limitation of the previous mentioned paper, is that the outcome of the research is based on the respondent's self-reported satisfaction of health. Health satisfaction is subjective and can vary per individual. Two equally healthy individuals might report difference in satisfaction of health that they experience. This can also lead to biased results, if differences in reporting are correlated with job stressors.

This research contributes to the current literature by measuring outcomes on mental health in numbers with the use of data on mental health care use of employees in the Netherlands. By doing this, the results are quantifiable and less suspect to variations in how respondents feel. Although mental health care use is not a perfect proxy for mental health, the association between the two is considerably strong. Research of the Dutch knowledge institute on mental health more than two-thirds of individuals with mental health disorders classified as mood disorders are making use of mental health care in the Netherlands (Veerbeek, Knispel, & Nuijen, 2015). The reason for using mental health care uptake as a proxy is further substantiated in the empirical strategy.

By examining these additional insights on how job-related stressors affect the mental health of employees, policy changes can be made. On the one hand, individual firms can change policies on the smallest scale. Firms have a financial incentive to keep their employees healthy. Reducing the psychological strain on employees can potentially improve their mental health and thereby reduce the amount of sick leave of employees, which would lead to less productivity losses due to workers being absent (Michie & Williams, 2003). Another financial incentive for changing policies would be the experience-rated premiums that companies in the Netherlands pay. This is a premium that a company pays depending on the number of workers that drop out of the workforce due to sickness. Lowering the number of employees that are forced to quit their job because of sickness means that the company pays lower premiums.

On the other hand, public policy can be adjusted, if underlying causes for mental health problems are present in all industries. Mental health problems are common across the whole job industry and cover all occupations. Minimizing productivity losses due to people being unable to work is very beneficial

from a societal point of view. If the causes can be addressed, there will also be lower societal costs in terms of unemployment benefits and in terms of healthcare costs.

The research question that of this study is the following: *'What is the effect of job-related psychological strain on the mental health of workers?'* This will be answered by measuring the effects of job-related stressors on the uptake of mental health care and the associated direct costs.

Firstly, a theoretical framework is illustrated to clarify and elaborate on the relevant theories and concepts as a base for the model that will be used to answer the research question. Besides, the current literature gap is examined to further explore the research question. Furthermore, the data and empirical strategy that are used in this research are described. Here, the characteristics of the dataset is mentioned and additionally some descriptive statistics are shown. The statistical model are set up and the reasoning behind it will be explained as well. The outcomes of the model will be presented in the results, followed by the discussion and conclusion of the results to answer the research question. This research and its final results will be addressed in the Dutch context.

Theoretical Framework

The first element that is taken into account in the empirical model is the health stock of a person. According to the research of Grossman (1972), health can be seen as a durable capital stock, which is affected by the behaviour of an individual. Each person is born with an endowed amount of health stock. Healthy practices such as exercise and medical care can increase this stock of health, while this capital stock is eroded by time and unhealthy practices such as smoking.

Specific job characteristics are also found to play a part in these detrimental effects on the health stock of an individual that Grossman describes. Both physical and psychological job-related stressors can lead to a faster deterioration of the health of employees (Galama & Van Kippersluis, 2018; Ravesteijn et al., 2018). It is hence reasonable to assume that working a high demand job can possibly lead to worse mental health.

Job-related stress seems to be one of the important stressors that affects the mental aspect of health of workers. The study from Ramirez, Graham, Richards, Gregory, & Cull (1996) finds that people who experience more stress have a higher probability of experiencing burnout and feeling overloaded. Stress playing an important role is also supported by other research that explains how excessive amounts of psychological strain, such as stress, affects health and can lead to diseases (McEwen, 1998; Colligan & Higgins, 2006). Also, one of the strongest effects of predicting anxiety disorders, depressive disorders and physical illnesses was found in jobs where employees are confronted with high psychological work demands, such as high amounts of stress in combination with a fast work pace,

workload, work conflict and tight deadlines (Stansfeld & Candy, 2006). Finally, stress at work has a positive direct effect on the burnout rate of employees, according to research of Kim & Stoner (2008).

In conclusion, all these papers show evidences of psychological stressors influencing certain aspects of the mental health of people, in particular work pressure and the associated work-related stress. These stressors can lead to burnout complaints, anxiety disorders and depressive disorders. However, it does seem unlikely that these job-related psychological stressors affect other aspects of mental health such as bipolar disorders or schizophrenia. Throughout this thesis, the term *mental health* will be used in this paper to specifically address the aspects of mental health that are affected by job-related psychological stressors.

Furthermore, Stansfeld & Candy (2006) discover that autonomy on the job plays an important role in the mental health of employees. They find that less freedom on the job is one of the characteristics that creates a high-strain job, contributing to worse mental health of employees. The importance of the effect of autonomy on mental health is also supported by the study of Karasek Jr (1979).

In contrary to the previous papers, the paper of Kossek, Lewis, & Hammer (2010) reports that organizational policies with a focus on more flexibility and autonomy for a better work-life balance can have mixed consequences. The study reports that in some cases these initiatives cause an increased work pressure which leads to a worse work-life balance due to the pressure of having to confine to the standards of an ideal worker. This decrease of work-life balance can affect the quality of life of an individual (Greenhouse, Collins, & Shaw, 2003). Thus it might be the case that an increase in autonomy might also have adverse effects.

In addition to autonomy, the paper of Karasek Jr (1979) also predicts that the interaction effect between autonomy and job stressors is an important factor regarding the mental strain on employees. The combination of high job demands, low flexibility on the job and little freedom in decision making is found to be affecting the mental health of workers negatively.

This interaction effect is further explored in the job demands-resources model, where the interaction between a lack of autonomy and extremely high job demands is a predictor for exhaustion (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001), depressive symptoms (Bourbonnais, Brisson, Moisan, & Vézina, 1996) and burnout (Schaufeli & Bakker, 2004; Bakker, Evangelia, & Verbeke, 2004). According to the models in these papers, there are job demands and job resources. Job demands consist of job-stressors such as physical workload and time pressure amongst others. Factors of job resources include job control (autonomy), job security, rewards and supervisor support. This model argues that there must be a balance between job demands and job resources. Excessive job demands in combination with insufficient job resources leads to exhaustion and health issues, while the reverse will cause employees

to be disengaged. All in all, it is plausible that this interaction effect is an important factor regarding the mental health care of employees.

Additional to the effect of autonomy, the papers of Karasek Jr (1979) and Ravesteijn et al. (2018) explain how physical workload is a factor that affects the health of employees. Since a combination of both physical and psychological strain on the job can affect mental health, it is important to take physical workload into account and separate the stressors to correctly estimate the effect of psychological strain. If this is not done, it could be that the negative effects of physical workload would be included in the estimator of psychological strain, which would lead to a downward bias.

Next to this, age is also is an important factor to take into account. It seems logical that older people are more prone to sickness and other negative health issues. This is also confirmed by the earlier stated paper of Ravesteijn et al. (2018), where they find that people of higher age are more affected by having low job control. Finally, their research could not find a causal effect of psychological strain on the satisfaction of health. The result that they found was almost completely due to selection. By looking at actual mental health treatment and economic productivity outcomes instead of satisfaction on health, we suspect to find evidence on the effect of psychological strain on the mental health of employees.

The current literature suggests that high psychological demands, such as high workload, stress and job flexibility, will indeed have an impact on the mental health of its workers. Since these characteristics differ per occupation, it is very likely that different jobs have a different toll on the mental health of its workers.

Data

The data in this research are sourced from two different organizations, Statistics Netherlands (*Centraal Bureau voor de Statistiek*; *CBS*) and the Netherlands Organization for Applied Scientific Research (*Nederlandse Organisatie voor Toegepast Natuurwetenschappelijk Onderzoek*; *TNO*). The *CBS* is an independent Dutch governmental institution that collects statistics and data about the Netherlands. The CBS tries to actively meet the needs of society by sharing its information with other governmental bodies, politics, media and the public. *TNO* is an independent public research organization located in the Netherlands as well, which aims to provide applied knowledge to companies and governments, focusing on change and transition in various societal themes.

The personal details, occupation and mental health care use of individuals in the sample are sourced from three different datasets from the CBS; respectively the *GBAPERSOONTAB, SPOLISBUS* and *ZVWZORGKOSTENTAB.* Six yearly datasets from 2010 until 2015 are used to make up a longitudinal

dataset. All individuals are assigned a personal identification number, making it possible to link these datasets and to keep track of individuals during the period of six years.

The data on stressors in various industries sourced from our final dataset, the Netherlands Working Conditions Survey (*Nationale Enquête Arbeidsomstandigheden; NEA*) of 2010 from TNO. One complication is that this data on job characteristics is only available in repeated cross section surveys. It is thus not possible to create a longitudinal dataset and link this directly to the other datasets.

To resolve this, the stressor outcomes of the NEA are taken and assigned to the respective industries of the SPOLISBUS. Linking the industries is done using a crosswalk, since the job industries in the NEA are coded according to the Standard Industrial Classifications (Dutch SBI-2008), as opposed to the Dutch classification per tax sector used in the SPOLISBUS. The crosswalk can be found in Appendix B. The outcomes for these stressors will then be held constant for the rest of the years as well, under the assumption that these stressors not have changed significantly over these six years. Additionally, it is essential that these outcomes are a good reflection of the stressors experienced by the individuals in their respective job industry. Since the NEA is weighed and made representative for the the Dutch working population by TNO, it satisfies this criteria.

The first dataset that is used is the GBAPERSOONTAB dataset, which is a dataset that contains all people registered in the municipal population registrations in the Netherlands. The gender and age of individuals come from this dataset. The sample used in this research is restricted to people aged between 18 and 65 in the year 2010. Reason for this is that this research is focused on the working population, analysing the effects of job stressors on the mental health of employees.

Next to this, the SPOLISBUS from the CBS is used to identify in which of the 67 job industries the individuals work. The data from the SPOLISBUS is derived from the *Polisadministratie*, which is a registry that contains monthly data on all insured employees in the Netherlands. Since all employees in the Netherlands are required to be insured, data on all legally working people in the Netherlands can be found in the SPOLISBUS. Yearly there are roughly 3 million individuals whose job industry is either unknown or not classified in the SPOLISBUS. Since it is not possible to estimate the effect of job stressors on these people they work in an unclassified job sector, these will be counted as missing.

The job industry of an individual is determined on the first month of the year. The assumption is thus made that the employee stays in the same industry for the rest of the year. For this research, all the people in the sample have been employed at least one year during these six years. If one is unemployed or working in an unknown or unclassified job sector, the individual is set as missing in that respective year. If multiple job industries are listed, the first industry listed is used for our sample.

To give an overview of the data in the sample, these job sectors have also been aggregated to 7 industries based on the Dutch collective labour agreement of the sector (Dutch CAO). The job sectors are in accordance with the 67 Dutch job industries as defined by the Dutch Tax and Customs Administration. A complete overview of the job industries can be found in Appendix A, while breakdown of aggregated industries can be found in Appendix B.

The use of mental health care is sourced from data from the ZVWZORGKOSTENTAB from CBS. This dataset contains data about the costs and reimbursements of health care to individuals. Data on mental health care use is split into basic mental health care and specialist mental health care. If the mental health issues are too severe to be treated in basic mental health care, the general practitioner can refer the patient to be treated under specialist mental health care. The measured costs are purely consultation costs with a mental health care professional. Primary care and medication are thus not included in these costs.

Again, since being insured is required by law, this dataset contains almost all registered residents of the Netherlands. The annual costs of mental health care use are observed as panel data from 2010 until 2015, to determine whether someone makes use of mental health care and whether this was basic mental health care or specialist mental health care. Additionally, the amount of expenditures are included, to analyse whether job stressors has an effect on the total amount of money individuals spend on mental health care.

The ZVWZORGKOSTENTAB is then linked to the GBAPERSOONSTAB to tie the use of mental health care to the personal details of individuals. Individuals who are present in this dataset but not in the GBAPERSOONTAB are dropped from the sample. As an example, this is the case when someone is insured via his employer in the Netherlands, but lives in another country.

In summary, the sample used in this research is a longitudinal dataset spanning from 2010 to 2015, made up of four different datasets. The sample is restricted to people with an age between 18 and 65 in the year 2010. Next to this, everyone in the sample was employed at least one year in one of the classified job industries. The sample consists of a total of 32,463,562 observations. One observation stands for one employed person in each year. Recurrent individuals are viewed as separate observations each year, thus a person can be counted for a maximum of six times for each year he is employed. This sample is used and kept the same for all the descriptive statistics, as well as in the models to analyse the effects of job-related stressors.

Table 1 shows the descriptive statistics of this total sample and the aggregated job sectors. For the models and analysis, the more detailed job classifications are used. The full descriptive statistics for the detailed job industries can be found in Appendix A. Around 5.78% of employed people in the

Netherlands makes use of mental health care. Ravesteijn, Schachar, Beekman, Janssen, & Jeurissen (2017) list depressive disorders, substance-related disorders and anxiety disorders as the most frequent diagnoses. The job sectors categorized under the Dutch subsidized sector has the highest rate of mental health care usage with 6.97%, while people working in military use the least mental health care. Only 2.84% of the employees in the dredging industry make use of mental health care, making it the industry with the lowest rate of mental health care use. The employment and reintegration industry is on the other side of the spectrum, with 12.49% of employees utilizing mental health care. Additionally, it can be seen that the gender proportions in some sectors are quite unbalanced. The education sector and the subsidized sector are female dominated, while governmental jobs and the military seem to be male-dominated fields. Painting companies and merchant shipping are the industries with the most unbalanced gender distribution, where 94% of the employees are male. Next to this, the private sector has the youngest average age, while the government has the oldest average age. The foodservice and hospitality industry has an average age of 33, making it the industry with the youngest average age. Private bus transport has the oldest average age of 51 years.

Table 1: Summary statistics of the aggregated job industries

	Age	Proportion of men	Proportion of Mental health care use	Observations
Total	43 (12)	0.51	0.0578	32,463,562
Private sector	40 (12)	0.63	0.0529	20,365,124
Subsidized sector	43 (12)	0.20	0.0697	6,937,654
Education	46 (12)	0.35	0.0628	2,406,939
Provinces, Municipalities, Water institutions	48 (11)	0.55	0.0609	1,101,193
Police, Judiciary	46 (11)	0.59	0.0543	922,389
Government	48 (11)	0.68	0.0670	624,965
Military	47 (11)	0.78	0.0472	105,298

Average age, male proportion and proportion of mental health care use in the researched sample. The used sample is a longitudinal dataset spanning from 2010-2015. The dataset consists of employed individuals in the Netherlands, aged between 18 and 65 in 2010. The job industries are aggregated based on the Dutch Tax and Customs Administration classifications. Recurrent individuals are viewed as separate observations each year. Standard deviations are in parenthesis. Source: CBS.

In Figure 1, the distribution of annual mental health care expenditures is shown for the researched sample. The people that do not have any mental health care costs are not included in the figure. There are 1,876,480 instances of individuals using mental health care in a year over the course of this six. On the other hand, there are 30,587,082 observations of individuals not incurring annual mental health from 2010 until 2015.

When taking up mental health care, an individual would most frequently spend less than €500 on mental health care in one year. This occurred 628,433 times during this period of six years. Moreover, there are 11,797 observations of an individual spending more than €50,000 on mental health care in one year. In Figure 1 it can be seen that there is a big drop in frequency for mental health care expenditures above €3,000 in a year. An interesting observation for the expenditures above €3,000 is that the number of observations rise for the expenditures above €4,000 and €5,000 respectively, after which the frequency drops again as the expenditures grow.

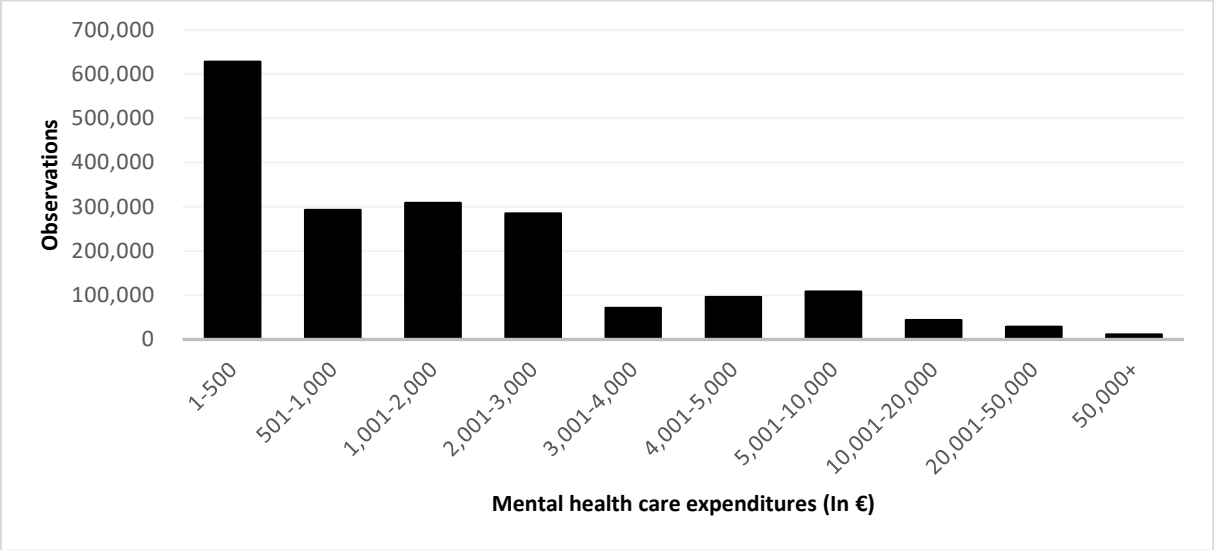

Figure 1: Distribution of annual mental health care expenditures

To be able to estimate the effects of job-related stressors, data on the autonomy, physical workload and psychological strain of employees in their respective job industries are sourced from the NEA. The questionnaire can be found in Appendix C. All stressors are aggregated to industry level, since occupational job codes are not available in the dataset. The NEA of 2010 contains responses of 23,788 people.

For the models in this research, the independent variable is used on whether someone has to work extra hard. Following the current literature, this aspect of work pressure best resembles the work pressure and job-related stress that is likely to negatively affect mental health.

Secondly, the autonomy regarding one's job is garnered. In total, there are six different questions on autonomy in the NEA. In this research the data on whether someone can decide how they want to do their work is used as a measure of autonomy.

Next to the psychological stressors, data on physical workload is used. The outcomes on exerting physical effort such as lifting, pulling and pushing is used to measure physical workload as a control variable.

In the NEA, respondents are asked to answer questions related to how often they are exposed to job-related stressors. Dependent on the subject of the question, they can answer either on a three-point scale or a four-point scale regarding the frequency of exposure. The three-point scale answers consist of '*never'*, '*sometimes'* and '*regularly'*, while the four-point scale answers consist of '*never'*, '*sometimes'*, '*often'* or '*always'.* The responses for physical workload and work pressure are coded in such a way that a higher score means higher levels of stress. Autonomy is coded as lack of autonomy. A higher score represents less autonomy.

Table 2: Job stressors of the aggregated job industries

	Physical workload	Lack of Autonomy	Work pressure	Observations
Total	1.60 (0.31)	1.48 (0.17)	2.18 (0.09)	32,463,562
Private sector	1.62	1.49	2.17	20,365,124
Subsidized sector	1.74	1.55	2.17	6,937,654
Education	1.22	1.40	2.33	2,406,939
Provinces, Municipalities, Water institutions	1.75	1.45	2.17	1,101,193
Police, Judiciary	1.21	1.31	2.13	922,389
Government	1.11	1.36	2.18	624,965
Military	1.73	1.48	2.10	105,298

This table presents the levels of stressors in different job industries of the researched sample. The used sample is a longitudinal dataset spanning from 2010-2015. The dataset consists of employed individuals in the Netherlands, aged between 18 and 65 in 2010. Physical workload and lack of autonomy are scaled from 1 to 3. Work pressure is scaled from 1 to 4. A higher number means a higher level of job stressor and less autonomy. The job industries are aggregated based on the Dutch Tax and Customs Administration classifications. Recurrent individuals are viewed as separate observations each year. Standard deviations are in parenthesis. Source: CBS, NEA.

Table 2 shows the job stressors for the aggregated job industries, while the full descriptive statistics for job stressors can be found in Appendix A. The employees in the education sector report their work pressure to be higher than the employees in other sectors, while their physical workload is respectively low. The reverse is true in military, where people report high physical workload but a relatively low work pressure.

Figure 3 shows the relation between physical strain and lack of autonomy for all the 67 job industries. The dots and trend line are weighed based on the number of observations per job industry. Overall, we can see that job industries with less autonomy are correlated with higher levels of physical strain.

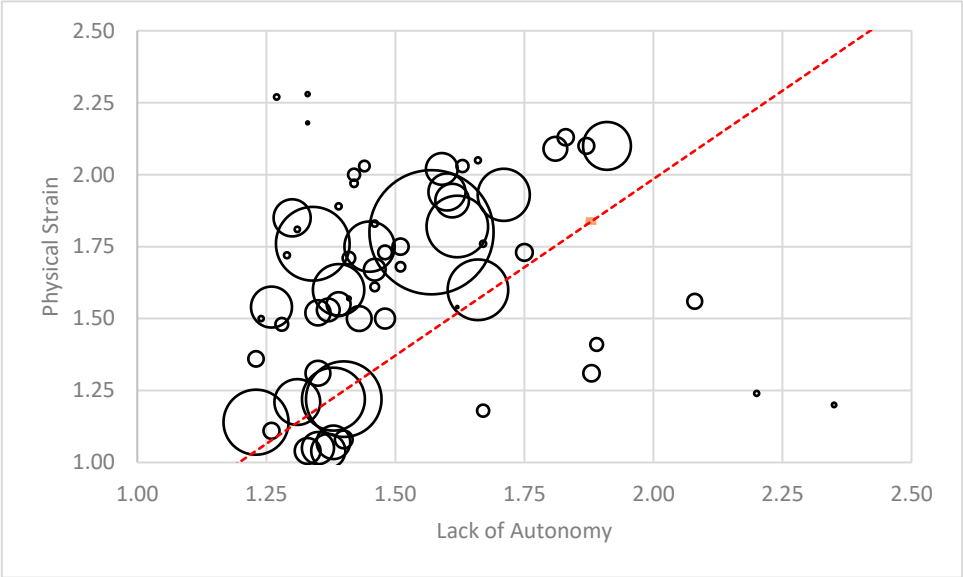

Figure 3: Relation between physical strain and lack of autonomy of job industries

Next to this, the scatter plot in Figure 4 shows that jobs with higher work pressure are less likely to be manual labour jobs which require a lot of physical effort. Figure 5 shows that jobs with high work pressure are often jobs that also have a high degree of autonomy.

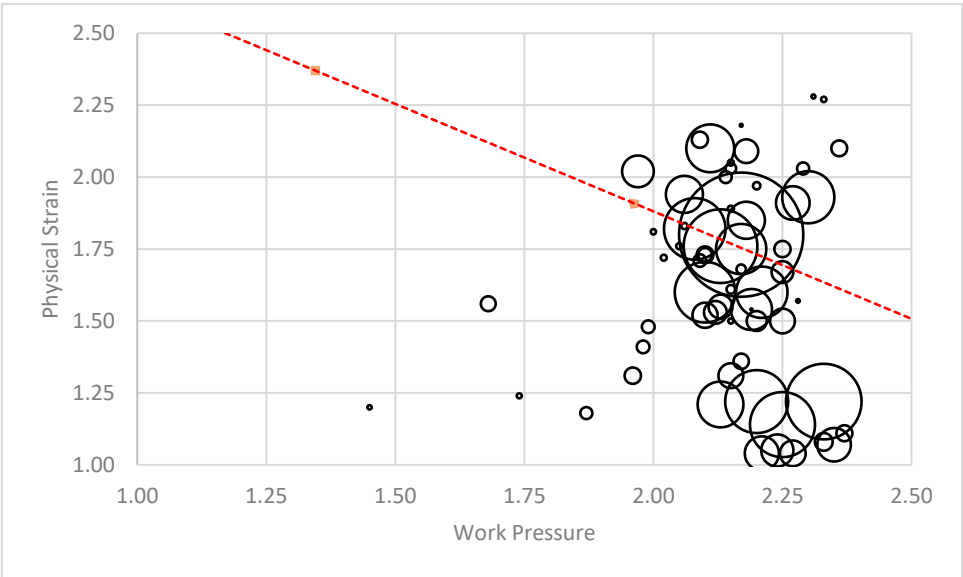

Figure 4: Relation between physical strain and work pressure of job industries

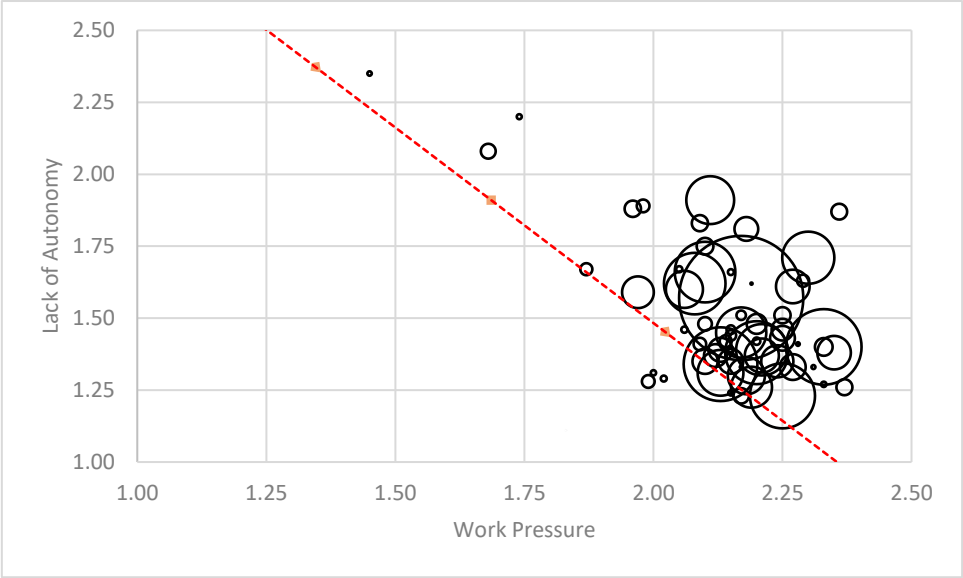

Figure 5: Relation between physical strain and work pressure of job industries

Empirical Strategy

Since mental health comprises numerous aspects, it is not possible to purely compare the use of mental health care across industries. There are factors that are likely to influence both the occupation that one might have and the use of mental health care. For instance, it might be the case that older people are more likely to have jobs with a high degree of autonomy while at the same time they are more inclined to use mental health care than younger people. If one would just compare across industries, the results would suggest that having a job with high autonomy has worse effects on your mental health than working a job with low autonomy. In this case, the uptake on mental health care would be explained by age, and not necessarily by the degree of autonomy.

To estimate the effects of job-related stressors on the mental health of individuals, we will take various outcome variables on the uptake of mental health care. The main advantage and reason for taking mental health care use as a proxy for mental health, is that this will result in a quantifiable outcome, unlike outcomes based on reported health for example. As stated earlier, research of the Dutch knowledge institute on mental health Trimbos shows that more than two-thirds of individuals with mental health disorders classified as mood disorders are utilizing mental health care in the Netherlands (Veerbeek, Knispel, & Nuijen, 2015). Since most job-related mental health disorders, such as burnouts, are stated in the literature as mood disorders, it can be said that the association between mental health and use of mental health care is considerably strong. Additionally, the report also shows that the uptake of mental health care in the Netherlands is relatively high as compared to other European countries, supporting the fact that access to mental health care in the Netherlands is adequate for the people who need it.

To measure the use of mental healthcare, four different outcome variables are measured using the same models. Firstly, this research focuses on whether someone has used any mental health care in the past year. Additionally, a differentiation is made between the use of basic mental health care and specialized mental health care to see if the effects of job stressors differ with regards to the various types of mental health care. The final aspect that that is analysed, is the total expenditures of individuals in a year on mental health care use, to measure the financial effects of job stressors.

As stated previously in the data section, the variables on job stressors are scaled on a three- or four-point scale based on frequency of occurrence, and can be found in Appendix C. The frequency of occurrence is coded in ascending order, where a higher number illustrates a worse evaluation. If work pressure — the evaluation of whether someone has to work extra hard — is taken as an example, '*never'* is be assigned a value of 0, '*sometimes*' is be assigned a value of 1, '*often'* is be assigned a value of 2 and '*always'* is be coded as a 3. This is a similar approach as earlier studies measuring job-related stressors (Johnson & Hall, 1988; Totterdell, Wood, & Wall, 2006)

Consequently, the level of psychological strain per industry, consisting of the autonomy and work pressure is assigned to the corresponding industry from the SPOLISBUS dataset using data from the NEA from 2010 using the crosswalk.

Besides these stressors, the physical workload is taken into account. The physical workload is added as a control variable, since this is likely to be connected to both the psychological aspect of work and the health of employees. The outcomes on physical workload will however not be discussed in depth, since the main focus of this research is the effect of psychological stressors.

For the outcomes of the effect of job stressors, the stressors are standardized by dividing the job stressors of the various industries by the standard deviation of the respective stressor. The taken standard deviation is weighed for the number of observations per job industry and calculated using the whole research sample. This is done since the outcomes will be quite abstract if taken by face value. For example, it will be difficult to grasp an increase of autonomy of 0.5 point.

Additionally, the stressor variables in the model is also be lagged by one year. This is done because the uptake of mental health care is measured at the start of each year. If the effect of the job stressor on mental health is researched, it is hence the case that we need to look at the job stressors that an individual experienced the year before. Next to this, it is unlikely that an individual would take up mental health care immediately when experiencing high work pressure on the first day of the job.

Results for five different models will be estimated. The first three models are simple regression models, just to show the rough association between the job stressors and mental health outcomes. The last two models are fixed effects models, to estimate the effects of the job stressors as accurate as possible.

For the first model, we estimate a very simple naive regression model that estimates the effects of work pressure on mental health care uptake. This model is estimated to get an impression of the effects of work pressure on mental health care uptake. Since this model does not control for any other variables, the estimated effect is likely to be biased. Next to this, we add the error term. The first model is specified as follows:

$$y_{i,t} = \alpha_i + \beta_1 Workpressure_{i,t} + \varepsilon_{i,t} \quad (1)$$

For the second estimated model, control variables that likely affect both the psychological strain one might experience and mental health are added. As stated in previous research, physical workload and autonomy are both likely to affect both the psychological strain and mental health of employees.

If we put all of this in a regression model, it looks like the following:

$$y_{i,t} = \alpha_i + \beta_1 Workpressure_{i,t-1} + \beta_2 PhysicalWorkload_{i,t-1} + \beta_3 Autonomy_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

In the third model, the interaction effect between the lack of autonomy and work pressure is added, in accordance with the research of Karasek Jr (1979).

$$y_{i,t} = \alpha_i + \beta_1 WorkPressure_{i,t-1} + \beta_2 PhysicalWorkload_{i,t-1} + \beta_3 Autonomy_{i,t-1} + \beta_4 (Autonomy * WorkPressure)_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

Next, a fixed effects model is used to identify the effects of job-related stressors on mental health. This model uses the framework of the paper of Ravesteijn et al. (2018) as a starting point. As stated earlier, their paper already provides a solid basis.

Using a fixed effects model has several uses. The main advantage is that self-selection in the baseline occupation will be controlled for to a certain extent. Normally, self-selection would present a problem, since it can be argued that people who are resistant to psychological strain will end up in jobs that are more stressful. In the end, no differences can be measured, even though the effects of job-related stressors might affect mental health. Due to this model following individual people over time, we can

measure the effects of the stressors of the occupation if the individual switches to a different job industry. In this case, constant unobserved factors like stress resistance and gender remain constant since they concern the same person. Thus, the effect of job stressors is separated and observed. The result is then less susceptible to self-selection in baseline occupation.

Besides self-selection in the baseline occupation, the model also controls for other causes of selection bias due to the filtering out of other time-invariant unobserved factors that might affect both job-related physical workload and the mental health outcomes.

Next to the variables that are used in the second model, age is also added as a control variable. Age is added as an ordinal variable, meaning that each year is its own group. The fixed effects model looks as follows:

$$y_{i,t} = \beta_1\left(WorkPressure_{i,t-1} - \overline{WorkPressure_i}\right) + \beta_2\left(PhysicalWorkload_{i,t-1} - \overline{PhysicalWorkload_i}\right) + \beta_3\left(Autonomy_{i,t-1} - \overline{Autonomy_i}\right) + \beta_4\left(Age_{i,t-1} - \overline{Age_i}\right) + \varepsilon_{i,t} \quad (4)$$

For our final model, an interaction effect is added for the lack of autonomy and work pressure to our fixed effects model, just like in the third model:

$$y_{i,t} = \beta_1\left(WorkPressure_{i,t-1} - \overline{WorkPressure_i}\right) + \beta_2\left(PhysicalWorkload_{i,t-1} - \overline{PhysicalWorkload_i}\right) + \beta_3\left(Autonomy_{i,t-1} - \overline{Autonomy_i}\right) + \beta_4\left(Age_{i,t-1} - \overline{Age_i}\right) + \beta_5((Autonomy * WorkPressure)_{i,t-1} - (\overline{Autonomy * WorkPressure})_i) + \varepsilon_{i,t} \quad (5)$$

Results

Total mental health care use

Table 3 shows the results for the five different models on the effects of job-related psychological stressors on all use of mental health care. As stated previously, the first three models are standard regressions, whereas the last two models are fixed effects models. Having standardized stressors means that based on Model 1, an increase in one standard deviation of work pressure increases the chance of mental health care uptake by 0.00159, as seen in the first column of Table 3.

When we add the control variables in Model 2, we see that the positive effect of work pressure on mental health care use increases to 0.00262. Besides the effect of work pressure, the model implies that an increase of one standard deviation of lack of autonomy has a larger significant effect (0.00893)

on mental health care uptake than work pressure. On the other hand, physical workload has the opposite effect in this model. An increase in one standard deviation of physical workload is predicted to significantly decrease the chance on mental health care uptake by -0.00626.

Table 3: Results for total mental health care use

	Associations for work pressure	Associations for all stressors	Associations for autonomy and work pressure interactions	FE for stressors	FE for autonomy and work pressure interactions
	(1)	(2)	(3)	(4)	(5)
Physical Workload at t-1		-0.00626***	-0.00928***	0.00077***	0.00139***
		(0.00005)	(0.00006)	(0.00015)	(0.00017)
Lack of Autonomy at t-1		0.00893***	-0.04426***	-0.00152***	0.01035***
		(0.00005)	(0.00066)	(0.00014)	(0.00182)
Work pressure at t-1	0.00159***	0.00262***	-0.01980***	0.00000	0.00499***
	(0.00004)	(0.00004)	(0.00029)	(0.00012)	(0.00077)
Lack of Autonomy × Work Pressure at t-1			0.00232***		-0.00051***
			(0.00003)		(0.00008)
Individual FE, controlled for age	✗	✗	✗	✓	✓
Observations	32,463,562	32,463,562	32,463,562	32,463,562	32,463,562

Result for mental health care use. Outcomes on standardized stressors. Fixed effects estimation is noted as FE. The robust standard errors are noted in parentheses. Significance at a 5 percent level is indicated as *, 1 percent level as **, 0.1 percent level as ***. The intercept is not shown in the table.

In the third column, the interaction effect between autonomy and work pressure is estimated. The coefficient shows that the interaction effect between the lack of autonomy and work pressure has indeed a positive effect on the mental health care usage, as predicted in the theoretical framework.

The fourth model shows the results for the fixed effects model. In this model, age has also been added as a control variable in addition to the control variables used in Model 2. The outcomes of the fourth model are strikingly different from the outcomes of the standard regression shown in column 2. The outcome for work pressure shows that the effect of work pressure is a precise zero. In addition to no significant effect being found, the coefficient is also zero. Next to this, we can see that this model

predicts that one standard deviation of decreased autonomy leads to a decrease in mental health care usage by 0.152%, which is contrary to the results of the second model.

In the fifth model, we can see the results of the interaction effect between work pressure and lack of autonomy in the fixed effects model. As can be seen from the results, the last model predicts a negative effect which is significant for the interaction between autonomy and work pressure, as opposed to the results of the standard regression of the second model.

In summary, the more comprehensive fixed effects models show surprising results that seem counterintuitive. This implies proof for work pressure having no effect on the uptake of mental health care use. In addition to this, lack of autonomy and the interaction of these stressors seem to lead to a small decrease in the uptake of total mental health care use. This is contradictory to the outcomes of the simple regressions, which are more in line with the expectations.

Basic mental health care use

In Table 4, the outcomes of the effects of job stressors on basic mental health care use are shown. As opposed to the results in Table 3, the use of specialist mental health care is not included in these results. For these results it is also the case that the stressors have been standardized.

Looking at the results of the first model, we can see that there is a positive correlation between work pressure and the uptake of basic mental health care. Remarkably, there is a stronger correlation here. This result is based on the coefficient of 0.00174 in Table 4, as compared to the result in Table 3 for total mental health care use, which shows a coefficient of 0.00159.

In the second column with control variables added, positive effects of physical workload and lack of autonomy on basic mental health care use and negative effects for physical workload are observed. Although all of the effects are smaller, the results are similar to the results found for total mental health care use in Table 3. The same goes for the positive interaction effect in the third column.

In the fourth column in Table 4, the results of the fixed effects model are illustrated. Here, an increase of work pressure has a positive effect on the basic mental health care use. Although the effect is significant at a 1 percent level, the coefficient is small. A one standard deviation increase in work pressure is predicted to increase general mental very health care uptake by 0,024%. Additionally, this model implies that there is no significant effect of physical workload on the uptake of general mental care, in contrast to the uptake of total mental health care.

Table 4: Results for general mental health care use

	Associations for work pressure	Associations for all stressors	Associations for autonomy and work pressure interactions	FE for stressors	FE for autonomy and work pressure interactions
	(1)	(2)	(3)	(4)	(5)
Physical Workload at t-1		-0.00224***	-0.00247***	-0.00003	0.00036**
		(0.00003)	(0.00004)	(0.00010)	(0.00012)
Lack of Autonomy at t-1		0.00263***	-0.00136**	-0.00038***	0.00702***
		(0.00003)	(0.00042)	(0.00010)	(0.00122)
Work Pressure at t-1	0.00174***	0.00189***	0.00021	0.00024**	0.00335***
	(0.00003)	(0.00003)	(0.00018)	(0.00008)	(0.00052)
Lack of Autonomy × Work pressure at t-1			0.00017***		-0.00032***
			(0.00002)		(0.00005)
Individual FE, controlled for age	✗	✗	✗	✓	✓
Observations	32,463,562	32,463,562	32,463,562	32,463,562	32,463,562

Result for basic mental health care use. Outcomes on standardized stressors. Fixed effects estimation is noted as FE. The robust standard errors are noted in parentheses. Significance at a 5 percent level is indicated as *, 1 percent level as **, 0.1 percent level as ***. The intercept is not shown in the table.

The outcomes of the fifth model show that the interaction between autonomy and work has a significantly negative effect on basic mental health care use. This outcome is similar to the effect on total mental health care use.

All in all, the most substantial difference in the outcomes on basic mental health care use is that a small significant positive effect is found for work pressure, in contrast to the outcomes on total mental care use. The small negative effects of lack of autonomy and a combination of lack of autonomy and work pressure on basic mental health care usage are similar to the outcomes on total mental healthcare use.

Specialist mental health care use

The outcomes of the effects of job stressors on specialist mental health care use are shown in Table 5. Based on the naïve basic regression of the first model, it seems like there is no significant correlation between work pressure and the uptake of specialist mental health care on first sight.

However, the results of the second model, show significant positive effects for work pressure and lack of autonomy. When we look at the outcome for work pressure in Table 5, we can see that the coefficient of work pressure is smaller (0.00091) as compared to the outcome of basic mental health care in Table 4 (0.00189). The effect of the lack of autonomy on specialist mental health care use is larger as compared to basic mental health care usage, respectively 0.00684 and 0.00263.

Table 5: Results for specialist mental health care use

	Associations for work pressure	Associations for all stressors	Associations for autonomy and work pressure interactions	FE for stressors	FE for autonomy and work pressure interactions
	(1)	(2)	(3)	(4)	(5)
Physical Workload at t-1		-0.00437***	-0.00729***	0.00074***	0.00105***
		(0.00004)	(0.00005)	(0.00012)	(0.00015)
Lack of Autonomy at t-1		0.00684***	-0.04462***	-0.00116***	0.00462**
		(0.00004)	(0.00055)	(0.00012)	(0.00151)
Work Pressure at t-1	-0.00006	0.00091***	-0.02078***	-0.00018	0.00225***
	(0.00003)	(0.00004)	(0.00024)	(0.00010)	(0.00064)
Lack of Autonomy × Work Pressure at t-1			0.00225***		-0.00025***
			(0.00002)		(0.00006)
Individual FE, controlled for age	✗	✗	✗	✓	✓
Observations	32,463,562	32,463,562	32,463,562	32,463,562	32,463,562

Result for specialist mental health care use. Outcomes on standardized stressors. Fixed effects estimation is noted as FE. The robust standard errors are noted in parentheses. Significance at a 5 percent level is indicated as *, 1 percent level as **, 0.1 percent level as ***. The intercept is not shown in the table.

The interaction effect of work pressure and autonomy found in the third model is also found to be significant and positive. Set side by side, the coefficient for specialist mental health care use of 0.00225 is slightly higher than the 0.00017 found for basic mental health care usage.

In column 4 we can see that there is no significant effect of work pressure on specialist mental health care use found by the fixed effects model. On the other hand, the outcome on lack of autonomy again is rather peculiar, indicating a significant negative effect on specialist mental health care uptake, which is similar to the outcome on basic mental health care.

Lastly, the results from Model 5 show that the interaction between work pressure and autonomy has a very small, significant effect on the uptake of specialist mental health care. The result is similar to the outcomes of the interaction effect on basic mental health care use and total mental health care use.

In summary, the results show similar outcomes regarding the effects of work pressure on specialist mental health care use, as compared to the effects on basic mental health care use.

Total mental health care expenditures

In Table 6, the results for the effect of job-related job stressors on the expenditures of an individual in a given year are shown. Looking at the results of the naïve basic regression in the first model, we can see that there is a small negative correlation between work pressure and mental health care expenditures. The outcome states that an increase of one standard deviation of work pressure decreases the mental health care expenditure by roughly 7.22 euros per year.

However, when the control variables are added, the results show that work pressure does not have a significant effect on the expenditures in column 2. The outcomes imply that less autonomy leads to an increase in mental health care expenditure.

The outcomes in column 3 for the interaction effect, show that the combination of a lack of autonomy and work pressure has a significant positive effect on the expenditures on mental health care.

In the fourth column, the outcomes for the fixed effects model are shown. These outcomes state that there is no significant effect of work pressure on mental health care expenditures. This is similar to the outcomes found for the effects on mental health care uptake. In addition to this, we see that the effects of lack of autonomy and physical workload on mental health care expenditures are not significant either.

Only the interaction effect between lack of autonomy and work pressure is found to have a significant negative effect at a 1 percent level, as can be seen in column 5.

All in all, the outcomes of table 6 imply that the job-related stressors have no significant effect on the separate mental health care expenditures and that only the interaction of lack of autonomy and work pressure leads to a small decrease in expenditures.

Table 6: Results for total mental health care expenditures (in €)

	Associations for work pressure	Associations for all stressors	Associations for autonomy and work pressure interactions	FE for stressors	FE for autonomy and work pressure interactions
	(1)	(2)	(3)	(4)	(5)
Physical Workload at t-1		-19.35832***	-37.22095***	0.19121	2.78399
		(0.50610)	(0.67413)	(1.51310)	(1.89526)
Lack of Autonomy at t-1		36.37262***	-278.1907***	-1.60007	48.14223**
		(0.51187)	(6.48836)	(1.52960)	(18.33261)
Work Pressure at t-1	-7.21633***	-0.55748	-133.1553 ***	1.42284	22.33171**
	(0.36436)	(0.42051)	(2.79483)	(1.20135)	(7.80979)
Lack of Autonomy × Work Pressure at t-1			13.72727***		-2.14988**
			(0.28516)		(0.79670)
Individual FE, controlled for age	✗	✗	✗	✓	✓
Observations	32,463,562	32,463,562	32,463,562	32,463,562	32,463,562

Result for total mental health care expenditures in euros. Outcomes on standardized stressors. Fixed effects estimation is noted as FE. The robust standard errors are noted in parentheses. Significance at a 5 percent level is indicated as *, 1 percent level as **, 0.1 percent level as ***. The intercept is not shown in the table.

Discussion

Firstly, when looking at the results of work pressure, very little evidence was found regarding its effects on mental health. This outcome is contrary to almost all studies in the literature review, which implied that work pressure plays an important role in the mental well-being of individuals and that high amounts of work pressure can lead to various mental health issues. Although the outcomes of the simple regressions with control variables show that work pressure has a positive significant effect on mental health care use, the fixed effects models lead to different conclusions.

An interesting finding is the precise zero found for the effect of work pressure on total mental health care use. This provides us with additional insights besides just finding no significant effect and attributing the association to selection. This result indicates proof that the work pressure has no effect on the total uptake of mental health care of individuals.

These findings on work pressure may be explained by selection, consistent with the earlier stated paper of Ravesteijn et al., (2018), which finds that selection is found to be the reason for the association between psychological workload and health. In the fixed effects models where selection is taken into account, the outcomes for work pressure are found to be not significant, both for mental health care use and expenditures. On the one hand, the association between the two is found to be significant in the basic regression models. On the other hand, when taking selection and other time-invariant factors into account in the fixed effects models, the effects are no longer explained by work pressure, leading us to selection as an important factor explaining this positive association.

With respect to the effects of autonomy, this study is unable to demonstrate that a lack of autonomy leads to worse mental health. Although the results from the simple regressions show that a lack of autonomy has a larger correlation with mental health care use, the fixed effect models provide opposite results. The outcomes for the fixed model find that less autonomy lead to less mental health care uptake, which is quite peculiar. This result is in line with the previous stated paper on autonomy from Kossek, Lewis & Hammer (2010), which implies that more autonomy might not always be better. One hypotesis could be that employees are able to continue working after working hours due to their autonomy, which can lead to worse mental health. Another possible explanation might be that employees with higher autonomy have generally more responsibilities, which could cause more psychological strain.

It must be noted however, that the discovered negative effects are quite small with respect to the mental health care use. Additionally, the effects are not significant regarding mental health care expenditures. It might be the case that the benefits in the other papers in the literature review cancel out the negatives to a certain extent, which leads to the effects being small.

The outcomes on the interaction effect between work pressure and lack of autonomy also seem to challenge the paper of Karasek Jr (1979), where he finds evidence for positive effect of this interaction on the mental health of individuals. Similar to their research, we find the same results for the interaction effect of our third model, using a standard regression analysis for our data. However, the fixed effects model seems to debunk this effect, showing negative effects on the uptake of mental health care use and expenditures. Thus, a combination of high work pressure and high autonomy might lead to worse mental health, which is contrary to previous literature. A possible explanation for this

might be that the negatives for autonomy are extra prominent if work pressure is high. It makes sense that people with a relatively high work pressure tend to also use their autonomy to work more and work harder in their free time, which might explain the interaction effect.

An implication of this result is the possibility that the interaction between autonomy and work pressure by itself is not causing worse mental health. These findings might help us understand the working of the underlying mechanisms of the job-demands model further. This result raises the question whether it might be the case that mental health is affected by other factors of the previous stated job-demands model, or by combinations between more factors than just autonomy and work pressure.

Although some proof is found for the effect of work pressure on mental health care use, part of the outcomes are still a result of selection. With just certain factors of autonomy and work pressure included in this research, it was not possible to further determine the cause of the differences between the industries in mental health care uptake. As stated before, other factors mentioned in the job-demands model might have more impact on the mental health of people.

However, these findings may also be somewhat limited because of the way the job-stressors are measured. Since the respondents can only answer on either a three-point or four-point scale, there is not much nuance possible when answering. It could be the case that some job industries are subject to different amounts of work pressure and autonomy, but that the data only partly shows this due to the lack of options in the questionnaire. After all, the distinction between working hard sometimes and working hard often is not quantifiable and may not be clear for the respondents of the questionnaire. Additionally, the questions on work pressure and autonomy might not include all aspects of the respective stressors that respondents experience. Autonomy, for example, consists of more than deciding how one does his work, but also consists of things like working from home and flexible working hours for instance.

Another limitation and source of uncertainty is the assumption that the data on job stressors stays constant over the span of the research. It is certainly possible that developments on the work floor during these six years may have changed certain job-stressors. One of these examples of change on the work floor is the increasing trend of working at home (Statistics Netherlands, 2018). This could lead to a change in autonomy levels over time in job industries where working from home is possible. Another scenario for change in job stressors is the technological advancement for mainly manual labour jobs, which would lead to a decrease in physical workload.

This limitation counts as well for the assumption that an individual remains employed in the same industry for the whole year. The job industry is recorded in January, so if an individual switches job industries in February, this will not be recorded until January next year. This will lead to incorrect

results, as the person will experience the effects of job-related stressors that do not match the respective job industry.

Next to this, a note of caution arises due to the job industry classification of the Tax and Customs Administration. Some industries are quite broad. For example, the healthcare, mental and social well-being group contains over six million individuals. This broad definition also leads to vastly different occupations being in the same industry. For example, this group contains doctors and nurses, but also contains people working in sports clubs. If they have very different working conditions and experience different work stressors, we would not be able to observe the stressors, even though the stressors might be quite extreme. Instead, the data shows an average of all the people in the group and this affects the outcomes.

The described outcomes are also somewhat limited because of measuring mental health by means of mental health care use and expenditures. Although, as stated previously, mental health and mental health care use are strongly correlated, there are still people who have mental health problems that do not take up mental health care. This phenomenon is also supported by the research of Jorm (2000), which states that people do not always know that their disorders or psychological distress is caused by mental health issues. The research also explains how people regularly differ in their beliefs about the causes and treatments of mental health problems. This hinders individuals to take up mental health care, even when they need it. Additionally, research shows that higher educated people are somewhat more likely to use mental health care than lower educated people in the Netherlands (ten Have, Oldehinkel, Vollebergh, & Ormel, 2003). Moreover, healthy people can also make use of mental health care (Veerbeek, Knispel, & Nuijen, 2015). For example, one could be visiting the psychologist for preventive reasons. These discrepancies between mental health problems and the use of mental health care could possibly lead to some varying outcomes.

Lastly, there are some limitations regarding the aspect of analysing people who switch job industries. When comparing the use of mental health care of an individual when he is working in different industries, we assume that the job stressors are the only things that change and affect the use of mental health care. However, it is likely that there are other underlying factors that causes someone to switch jobs. It might be the case that someone feels like the work culture fits better in another job industry, more money can be earned, or the person simply wants to figure out whether he likes working in another job industry. It is not far-fetched to think that all these things affect both the perception of job-related psychological stressors and the mental health state of the individual. If this would indeed be the case, it would lead to biases in the current outcomes.

The reliability of the results stated in this research should fare considerably well regarding the Netherlands. Firstly, all data, except for the stressors, consist of all individuals registered in the Netherlands. Additionally, the data on stressors use national data from the Netherlands that is weighted to represent the population. Care should be taken however when looking at different countries. As stated earlier, there are quite some differences concerning mental health, even amongst similar European countries. As stated before, there are quite some differences in mental health care uptake in each country. In addition, with possible differences in working culture, mental health awareness and stigmas surrounding mental health issues, extrapolating the results to other countries should be done with caution.

Conclusion

This study set out to research the effect of job-related psychological stressors on mental health. While our results confirm that there is an association between the psychological stressors and mental health issues, it is unlikely that this is the result of a direct causal effect. This paper contributes to the existing literature in two ways.

First, we measured the effects of both autonomy and work pressure on quantifiable outcomes, mental health care use and mental health care expenditures. This is done by comparing and analysing the varying levels of stressors experienced in different job industries. Additionally, by taking selection into account in our model, it can be seen whether these stressors are due to selection or due to causality.

Second, the results on interaction between work pressure and autonomy is compared to the research of Karasek Jr. These outcomes then provide further insights in the mechanisms of the job-demands model, which is an indicator for productivity related mental health issues such as burnouts.

This research has found proof that a higher work pressure by itself has no effect on the mental health of individuals. Firstly, proof is found that an increase in work pressure does not increase the mental health care usage of an individual. Additionally, the increase in work pressure also shows no significant effect on an individual's expenditure on mental health.

Next to this, an increase in autonomy is found to have a small significant negative effect on mental health, which is contrary to most literature. A one standard deviation increase in autonomy leads to a 0,152% increase in total mental health care use. However, autonomy does not seem to have a significant effect on the amount of mental health care expenditures.

Finally, the study shows that the combination of work pressure and a lack of autonomy does not affect one's mental health negatively. This adds further insights to the working of the job-demands model,

suggesting that the causes for mental health issues consist of another combination of factors stated in the model.

However, based on the outcomes of this study, it cannot be ruled out that work pressure and autonomy on the job lead to worse mental health. This research even finds the opposite for autonomy, namely that an increase in autonomy could possibly lead to worse mental health for employees. Therefore, it would be suggested that employers decide carefully in adjusting their work policies that affect these job stressors.

This study also shows that the literature is not in accordance with the precise effects of job-related psychological stressors yet. Therefore, it is recommended that future research on this topic will be conducted. A natural progression of this study is to analyse the effect of stressors on the specific mental health care diagnoses related to job-stressors. Further research is also required to determine the effects of the specific, underlying factors of autonomy and work pressure. When taking autonomy for example, flexible working hours may lead to an improvement in mental health, while the possibility of continuing work at home might lead to a worsening in mental health. All in all, more research should be done on this topic before more definite and concrete practical implications and changes can be suggested.

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Appendix

Appendix A: Detailed job industries and descriptive statistics

	Age	Men	Mental health care use	Physical workload	Lack of autonomy	Work pressure	Observations
Total	43 (12)	0.51	0.0578	1.60 (0.31)	1.48 (0.17)	2.18 (0.09)	32,463,562
Healthcare, Mental and Social well-being	43 (12)	0.17	0.0678	1.80	1.57	2.17	6,322,503
Education and Science	46 (12)	0.35	0.0628	1.22	1.40	2.33	2,406,939
Metal Industry	43 (12)	0.87	0.0380	1.76	1.34	2.13	2,295,041
Professional Services II	39 (11)	0.67	0.0570	1.14	1.23	2.25	1,802,921
Professional Services III	42 (12)	0.51	0.0595	1.22	1.38	2.20	1,691,933
Retail Trade	38 (13)	0.34	0.0578	1.82	1.62	2.08	1,621,370
Employment Agencies	35 (12)	0.61	0.0798	1.60	1.66	2.10	1,574,434
Foodservice Industry& Hospitality	33 (12)	0.49	0.0615	1.93	1.71	2.30	1,180,341
Wholesale II	42 (11)	0.65	0.0478	1.60	1.39	2.21	1,148,390
Provinces, Municipalities, Water boards	48 (11)	0.55	0.0609	1.75	1.45	2.17	1,101,193
Chain stores	35 (13)	0.36	0.0617	2.10	1.91	2.11	1,003,663
Government, Police and Judiciary	46 (11)	0.59	0.0543	1.21	1.31	2.13	922,389
Wholesale I	42 (11)	0.77	0.0451	1.54	1.26	2.19	748,775
Construction Companies	43 (12)	0.92	0.0310	1.85	1.30	2.18	621,773
Other goods transport over land and air	43 (12)	0.90	0.0368	1.94	1.60	2.06	620,477
Government, other institutions	48 (11)	0.66	0.0711	1.04	1.37	2.21	531,331
Cleaning	43 (12)	0.31	0.0624	1.91	1.61	2.27	517,462
Banks	43 (10)	0.52	0.0536	1.07	1.38	2.35	515,195
Professional Services I	39 (11)	0.42	0.0541	1.05	1.35	2.24	475,808
Agricultural companies	41 (13)	0.70	0.0371	2.02	1.59	1.97	464,890

Insurance and Health Insurance companies	44 (10)	0.52	0.0557	1.04	1.33	2.27	317,823
Chemical Industry	46 (10)	0.76	0.0414	1.52	1.35	2.10	303,911
Employment and Reintegration	47 (11)	0.68	0.1249	1.31	1.35	2.15	297,328
Port industries	41 (11)	0.74	0.0448	1.50	1.43	2.25	295,771
Cultural organisations	41 (13)	0.47	0.0735	1.55	1.39	2.13	277,946
Transport postal services	44 (13)	0.55	0.0641	2.09	1.81	2.18	273,726
General Industry	45 (10)	0.73	0.0410	1.53	1.37	2.12	254,293
Food Industry	45 (11)	0.75	0.0396	1.67	1.46	2.25	234,334
Other branches of business and profession	42 (11)	0.68	0.0509	1.50	1.48	2.20	201,088
Telecommunications	42 (11)	0.74	0.0533	1.08	1.40	2.33	164,069
Transport KLM	45 (10)	0.58	0.0525	1.73	1.75	2.10	148,683
Security Companies	40 (12)	0.77	0.0668	1.31	1.88	1.96	143,024
Graphic Industry excl. photography	45 (11)	0.74	0.0479	1.75	1.51	2.25	141,038
Bakers	41 (13)	0.45	0.0465	2.13	1.83	2.09	140,147
Publishers	43 (11)	0.49	0.0650	1.11	1.26	2.37	137,616
Butchers various	43 (12)	0.59	0.0399	2.10	1.87	2.36	134,352
Electronic Industry	45 (10)	0.81	0.0387	1.36	1.23	2.17	128,192
Taxi- and ambulance transportation	49 (12)	0.67	0.0560	1.56	2.08	1.68	121,057
Military	47 (11)	0.78	0.0472	1.73	1.48	2.10	105,298
Public Utilities	46 (11)	0.78	0.0437	1.48	1.28	1.99	93,634
Public Transport	51 (10)	0.79	0.0466	1.41	1.89	1.98	93,625
Stone, cement, glass and ceramic industry	47 (10)	0.88	0.0394	1.71	1.41	2.09	91,949
Catering	46 (12)	0.24	0.0539	2.03	1.63	2.29	85,793
Transport NS	48 (10)	0.75	0.0451	1.18	1.67	1.87	85,233
Painting companies	44 (13)	0.94	0.0353	2.00	1.42	2.14	84,663
Furniture and organ building industry	42 (12)	0.84	0.0406	2.03	1.44	2.15	68,974
Dairy Industry	45 (11)	0.78	0.0379	1.68	1.51	2.17	57,685
Sugar processing industry	44 (11)	0.63	0.0407	1.61	1.46	2.15	50,805
Carpenter Industry	43 (11)	0.92	0.0387	1.97	1.42	2.20	39,688

Textile Industry	46 (11)	0.75	0.0374	1.83	1.46	2.06	31,346
Railway Construction	46 (10)	0.83	0.0355	1.89	1.39	2.15	30,553
Wholesale in wood and wood construction	44 (11)	0.85	0.0379	1.76	1.67	2.05	30,345
Inland navigation	41 (14)	0.83	0.0465	1.72	1.29	2.02	29,445
Wood, brush and packaging industry	43 (12)	0.85	0.0426	2.05	1.66	2.15	28,968
Plaster company	40 (12)	0.93	0.0407	2.27	1.27	2.33	25,263
Dredging company	43 (11)	0.90	0.0284	1.81	1.31	2.00	25,078
Merchant shipping	41 (13)	0.94	0.0306	1.50	1.24	2.15	24,178
Other passenger transport land and air	35 (13)	0.73	0.0501	1.24	2.20	1.74	23,172
Private bus transport	51 (12)	0.83	0.0351	1.20	2.35	1.45	19,746
Roofing company	42 (12)	0.93	0.0417	2.28	1.33	2.31	17,489
Tobacco processing Industry	46 (10)	0.81	0.0416	1.57	1.41	2.28	15,379
Port classifiers	44 (11)	0.90	0.0392	2.18	1.33	2.17	12,129
Mortar company	49 (10)	0.92	0.0309	1.54	1.62	2.19	9,223
Stonemasonry	45 (11)	0.84	0.0407	2.24	1.11	1.83	2,675

Notes: This table presents the average age, male proportion, proportion of mental health care use and levels of stressors in different job industries of the researched sample. The used sample is a longitudinal dataset spanning from 2010-2015. The dataset consists of employed individuals in the Netherlands, aged between 18 and 65 in 2010. Physical workload and lack of autonomy are scaled from 1 to 3. Work pressure is scaled from 1 to 4. A higher number means a higher level of job stressor and less autonomy. The job industries are aggregated based on the Dutch Tax and Customs Administration classifications. Recurrent individuals are viewed as separate observations each year. Standard deviations are in parenthesis. Source: CBS, NEA

Appendix B: Sector Crosswalks

Tax & Customs sector classification (SPOLISBUS)	**SBI-2008 (NEA)**	**Aggregated job sectors**
Agricultural companies	Agriculture, forestry and fishing	Private sector
Bakers	Manufacture of bakery, pastry and farinaceous products	Private sector
Banks	Financial institutions, except insurance and pension funding	Private sector
Butchers various	Shops selling meat and meat products, game and poultry	Private sector
Carpenter Industry	Manufacture of other builders' carpentry and joinery Manufacturing of wooden doors, windows and frames Manufacturing of other builders' carpentry	Private sector
Catering	Canteens and catering	Private sector
Chain stores	Retail sale in non-specialised stores	Private sector
Chemical Industry	Manufacture of coke and refined petroleum products, Manufacture of chemicals and chemical products	Private sector
Cleaning	Cleaning activities	Private sector
Construction Companies	Construction	Private sector
Cultural organisations	Arts, Lending of cultural goods, public archives, museums, botanical and zoological gardens and nature reserves activities	Private sector
Dairy Industry	Manufacture of dairy products	Private sector
Dredging company	Mining of stone, sand and clay	Private sector
Education and Science	Research and development, Education	Education
Electronic Industry	Manufacture of computers, electronic and optical products, Manufacture of electrical equipment	Private sector
Employment Agencies	Employment placement agencies	Private sector
Employment and Reintegration	Temporary employment agencies and job pools	Subsidized sector
Food Industry	Manufacture of food products, Manufacture of beverages	Private sector
Foodservice Industry& Hospitality	Accommodation, Restaurants, Bars	Private sector

Tax & Customs sector classification (SPOLISBUS)	SBI-2008 (NEA)	Aggregated job sectors
Furniture and organ building industry	Manufacture of furniture	Private sector
General Industry	Programming and broadcasting, Support activities in the field of information technology, Information service activities, Other information service activities, Manufacture of wearing apparel, Manufacture of leather, products of leather and footwear, Manufacture of paper and paper products, Manufacture of basic pharmaceutical products and pharmaceutical preparations, Manufacture of rubber and plastic products, Electricity, gas, steam and air conditioning supply	Private sector
Government, other institutions	Compulsory social security	Government
Graphic Industry excl. photography	Reproduction of recorded media, photo and film developing	Private sector
Healthcare, Mental and Social well-being	Human health activities, Residential care and guidance, Social work activities without accommodation, Sports and recreation, World view and political organizations, interest and ideological organizations, hobby clubs	Subsidized sector
Inland navigation	Inland passenger water transport and ferry-services, Support activities for transport	Private sector
Insurance and Health Insurance companies	Insurance and pension funding	Subsidized sector
Merchant shipping	Water transport	Private sector

Tax & Customs sector classification (SPOLISBUS)	SBI-2008 (NEA)	Aggregated job sectors
Metal Industry	Manufacture of metals, Casting of metals, Manufacture of fabricated metal products, except machinery and equipment	Private sector
Military	Defence activities	Military
Mortar company	Manufacture of ready-mixed concrete, Manufacture of mortars	Private sector
Other branches of business and profession	Veterinary activities, Renting and leasing of motor vehicles, consumer goods, machines and other tangible goods, Travel agencies, tour operators, tourist information and reservation services, Lotteries and betting	Private sector
Other goods transport over land and air	Removal services, Freight air transport	Private sector
Other passenger transport land and air	Non-scheduled private transport by bus	Private sector
Painting companies	Painting and glazing	Private sector
Plaster company	Plastering	Private sector
Government, Police and Judiciary	Public administration, public services and compulsory social security	Police, Judiciary
Port classifiers	Repair and maintenance of ships and boats	Private sector
Port industries	Warehousing and support activities for transportation	Private sector
Private bus transport	Scheduled private transport by bus	Private sector
Professional Services I	Legal services, accounting, tax consultancy, administration	Private sector
Professional Services II	Support activities in the field of information technology, Holding companies, Management and business consultancy, Architects, engineers and technical design and consultancy; testing and analysis, Advertising and market research, Industrial design, photography.	Private sector
Professional Services III	Investment funds, Financial intermediation, consultancy, Renting and buying and selling of real estate, Translators and interpreters, Veterinary activities, Other (specialised) business services	Private sector

Tax & Customs sector classification (SPOLISBUS)	SBI-2008 (NEA)	Aggregated job sectors
Provinces, Municipalities, Water boards	Municipal housing, Construction of utility projects for fluids; water well drilling	Provinces, Municipalities, Water boards
Public Transport	Transport by bus, tram and subway	Private sector
Public Utilities	Water supply; sewerage, waste management and remediation activities, Electricity, gas, steam and air conditioning supply	Government
Publishers	Publishing	Private sector
Railway Construction	Construction of railways and underground railways	Private sector
Retail Trade	Retail trade	Private sector
Roofing company	Roofing	Private sector
Security Companies	Security and investigation	Private sector
Stone, cement, glass and ceramic industry	Manufacture of other non-metallic mineral products	Private sector
Stonemasonry	Stone dressing	Private sector
Sugar processing industry	Manufacture of sugar	Private sector
Taxi- and ambulance transportation	Taxi operation	Private sector
Telecommunications	Telecommunications	Private sector
Textile Industry	Manufacture of textiles	Private sector
Tobacco processing Industry	Manufacture of tobacco products	Private sector
Transport KLM	Air transport	Private sector
Transport NS	Passenger rail transport (no tram or metro), Freight rail transport	Private sector
Transport postal services	Postal and courier activities	Private sector

Tax & Customs sector classification (SPOLISBUS)	SBI-2008 (NEA)	Aggregated job sectors
Wholesale I	Sale of motor vehicle parts and accessories, Sale and repair of motorcycles and related parts, Wholesale of information and communication equipment, Wholesale of other machines, equipment and supplies for manufacturing and trade, Other specialised wholesale	Private sector
Wholesale II	Wholesale of agricultural products and live animals, Wholesale of food and beverages, Wholesale of consumer goods	Private sector
Wholesale in wood and wood construction	Wholesale of wood and board	Private sector
Wood, brush and packaging industry	Manufacture of products of wood and plaiting materials	Private sector

This crosswalk is used to assign the NEA stressors to their respective Tax & Customs sector classification. This is done since the job industries in the NEA are coded accordingly to the SBI-2008, while the datasets from the CBS are coded accordingly to the Dutch tax & customs classification. The crosswalk is made based on the explanatory sector descriptions of the Dutch tax authority. The crosswalk between the NEA and the aggregated job sectors are made based on the Dutch collective labour agreement of the sector (Dutch CAO). Source: CBS, NEA, Dutch tax authority.

Appendix C: NEA questions

Question on autonomy	Answer
Can you decide for yourself how you want to do your work?	Regularly (1), sometimes (2), never (3)

Question on work pressure	Answer
Do you have to work extra hard?	Never (1), sometimes (2), often (3), always (4)

Question on physical workload	Answer
Do you do work that requires a lot of effort, for example when lifting, pushing, pulling or carrying, or do you use tools or devices that require a lot of effort in your work?	Never (1), sometimes (2), regularly (3)