Perceived health and productivity when working from home during the COVID-19 pandemic

Investigating the influence of personal- and environmental factors on perceived health and productivity during obliged telework

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PERCEIVED HEALTH AND PRODUCTIVITY WHEN WORKING FROM HOME DURING THE COVID-19 PANDEMIC

Investigating the influence of personal- and environmental factors on perceived health and productivity during obliged telework

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COLOPHON

Perceived health and productivity when working from home during the COVID-19 pandemic
Investigating the influence of personal- and environmental factors on perceived health and productivity during obliged telework

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DATE

6 July 2021

PREFACE

This master thesis is the final product of my graduation project as part of my master's degree in Architecture, Building and Planning: Urban Systems & Real Estate at the Eindhoven University of Technology, and is an accumulation of all the professional knowledge I have acquired so far.

First, I would like to express my gratitude towards my parents Willie & Jolanda Voulon for their unconditional love throughout the years. Thank you for being such good role models, for teaching me to work hard and to care for others. I wouldn't be who I am today without your wisdom, support, honesty and advice. Moreover, my thanks go out to my sister, Anne Voulon, for always being so thoughtful of me and our parents. You all inspire me in more ways than you think.

Second, I would like to express my gratitude towards my three supervisors, Rianne Appel-Meulenbroek, Lisanne Bergefurt and Monique Arkesteijn. Without your help, thoughts, and feedback this thesis could never be presented in this quality and form. It has been a pleasure working with you all.

Last, an enormous 'thank you' to all my friends, fellow students, family and close acquaintances for their support all these years. Your support has carried me through difficult times.

My academic career has been quite long. When graduating from preparatory secondary vocational education (VMBO-t) and school of higher general secondary education (HAVO), I barely had an idea what to study next. After graduating from Avans Hogeschool's Real Estate and Construction Management study, I still felt hungry for more knowledge and I did not yet feel confident enough to be successful in my professional career. This motivated me to start my masters' at the Eindhoven University of Technology, where I met many new friends. My master-study has provided me with the knowledge, critical thinking skills and confidence needed to be successful in my future professional career. Also, it has provided me with insight about myself as a person – my personal goals, my driving forces, my strengths and weaknesses.

Concluding, I would like to urge you to also look behind the statistics provided in this research. Quantitative research makes it difficult to empathize with the individuals that are studied. We must not forget that many people are having a difficult time during the COVID-19 pandemic and might have lost friends or family to COVID-19, lost their job, or had to deal with other difficult situations. Therefore, I ask you to try and keep the human scale in mind when reading this thesis.

Thijs Voulon

Eindhoven, July 2021

EXECUTIVE SUMMARY

During the COVID-19 pandemic, office workers were obliged to work (almost) entirely from their own homes. Alongside known positive aspects of home-based telework, such as increased flexibility and job satisfaction, telework is also associated with reduced career progression and organisational support, increased presenteeism, and feelings of social isolation. Furthermore, telework is found to have effects on the physical, mental, and social health of employees, as well as their productivity.

Previous research stated that the success of telework strongly depends on the personal and environmental characteristics of the teleworker. However, there is only limited knowledge available on the relationship between the personal- and environmental factors of teleworkers and their health and productivity, especially when teleworkers are obliged to work from home full-time. Therefore, this research aimed to identify how the personal and environmental factors of teleworkers affect their health and perceived productivity during the COVID-19 pandemic, by answering the following research question:

'Which personal- and environmental factors are related to employee health and productivity when working (almost) fully from home during the COVID-19 pandemic, and how does health mediate these relationships?'.

In order to answer the research question, two newly available existing datasets, provided by the "We Work from Home (WWH)" research project (a collaboration between the Center for People and Buildings, Aestate, Eindhoven University of Technology, and the Delft University of Technology), containing 25,058 and 18,859 valid responses, were used for quantitative analysis. Between the 27th of April and the 20th of November of 2020, the research project collected data on the health and productivity of Dutch office workers of different public organisations, who were obliged to work from home due to the COVID-19 lockdown. The research sample was found to differ from the Dutch labour force, as Dutch public organisations were found to be slightly more male-dominated (52%), relatively old, and highly educated in general.

Findings showed that, in general, the teleworkers in the sample had quite good perceived health. First, regarding physical health, 42.7% of respondents reported experiencing no musculoskeletal problems and 70.9% of respondents reported the absence of symptoms of Sick Building Syndrome (SBS). Second, it was found that, even in later cohorts, mental wellbeing was scored well as low job stress (μ= 2.47) and exhaustion (μ= 2.49) were reported. Regarding social wellbeing, respondents stated that they missed informal contact with their colleagues and being in the same physical space with them. Consequently, professional isolation was rated slightly higher (μ= 3.15). Only 6.2% of respondents reported calling in sick due to their respective health problems.

Bivariate and path analyses revealed that gender, age and education level were significantly related to organisational and managerial support, musculoskeletal health, suffering from SBS symptoms, occupational stress, depression, exhaustion, (work) engagement, professional isolation and perceived productivity. Whether the at-home workplace was furnished and/or enclosed was found to be positively related to physical health, as well as mental health, social health, and perceived productivity. Both the presence of children in the household and living with others was found to be related to mental and social health. The degree of support one experiences while teleworking was found to be related to mental and social health, in which high support was associated with greater mental and social health.

Path analysis revealed that gender, age, education, the at-home workspace, the presence of children in the household, and perceived organisational support were significantly related to perceived productivity. However, most of these effects were found to be mediated by physical, mental, and social

health aspects. Furthermore, it was found that more than half of the total effects from personal and environmental characteristics on perceived productivity were mediated by the different health aspects in the model, except for the effects of gender and whether someone has children on perceived productivity.

The current study used a person-environment fit approach to investigate the relationships between the personal and environmental factors of teleworkers and their health and productivity outcomes. Although health aspects in the model were found to influence perceived productivity the most, it is found that the physical and social suitability of the at-home workspace plays a significant role in successful and healthy telework. Consequently, the results of the current research emphasize that a suitable home environment must be a prerequisite for telework. Furthermore, it is required that significant investments are made in protecting and promoting occupational health among (tele)workers.

This study was conducted during the COVID-pandemic lockdowns in the Netherlands. Therefore, some of the findings regarding teleworker health may contain biases or exaggerations, hence limiting the generalizability of the results. The results and interpretations are also limited by not having assessed potentially influential aspects of the physical and social working environment (e.g. indoor temperature, lighting and noise), as well as important aspects of physical, mental and social health (e.g. job satisfaction and happiness). Last, the results of this research are limited by the methodological and practical limitations of Structural Equation Modelling (SEM) regarding the use of exogeneous dichotomous variables.

The knowledge gained from the current study can be used for further research and can assist in the design and implementation of policies for improving, protecting and promoting occupational health practices, both in the office and at home. Future research should first try to overcome the limitations of the current study, for example by also assessing the unidentified influential aspects of the physical and social working environment (e.g. satisfaction with lighting, temperature and noise, as well as the age of the youngest child in the household) and important aspects of physical, mental and social health (e.g. quality of life, happiness and strain). By including these characteristics and health aspects, an even more comprehensive understanding of the influences of working from home, and the role of personal and environmental characteristics can be produced. Furthermore, future research should consider using additional established scales for the assessment of the aforementioned (health) aspects to further increase the reliability of the findings.

MANAGEMENT SAMENVATTING

Tijdens de COVID-19 pandemie waren kantoormedewerkers verplicht om (indien mogelijk) volledig vanuit hun eigen huis te werken. Naast bekende positieve aspecten van thuiswerken, zoals een toename in flexibiliteit en werktevredenheid, heeft thuiswerken ook negatieve kanten. Zo kan thuiswerken leiden tot een verminderde loopbaanontwikkeling en organisatorische ondersteuning, toegenomen gevoelens van sociaal isolement en het werken ondanks dat je ziek bent (presenteïsme). Daarnaast laat onderzoek zien dat thuiswerken gevolgen kan hebben voor de fysieke, mentale en sociale gezondheid van werknemers en hun productiviteit.

Uit eerder onderzoek blijkt dat het succes van thuiswerken sterk afhankelijk is van de persoonlijke- en omgevingskenmerken van de werknemer. Er is slechts beperkte kennis slechts beschikbaar over de relatie tussen deze factoren en hun gezondheid en productiviteit, vooral wanneer men verplicht is om fulltime thuis te werken. Dit onderzoek is daarom gericht op het identificeren van, en hoe, de persoonlijke en omgevingsfactoren van thuiswerkers hun gezondheid en productiviteit beïnvloedt tijdens de COVID-19 pandemie. Dit wordt gedaan door de volgende onderzoeksvraag te beantwoorden:

'Welke persoonlijke- en omgevingsfactoren beïnvloeden de gezondheid en productiviteit van werknemers wanneer zij (bijna) volledig thuiswerken tijdens de COVID-19 pandemie, en hoe medieert gezondheid de effecten van deze factoren op productiviteit?'.

Om de onderzoeksvraag te beantwoorden werden twee recent beschikbare datasets gebruikt voor kwantitatieve analyses. De datasets werden verstrekt door het "We Werken Thuis" (WWT) onderzoeksproject, een samenwerking tussen het Center for People and Buildings (CfPB), Aestate, de Technische Universiteit Eindhoven en de Technische Universiteit Delft en bevatten 25.058 en 18.859 geldige antwoorden. Door middel van wekelijkse vragenlijsten, verzamelde WWT gegevens over de gezondheid en productiviteit van Nederlandse kantoormedewerkers van verschillende overheidsorganisaties. De medewerkers waren verplicht thuis te werken, als gevolg van de COVID-19 lockdown, tussen 27 april en 20 november van 2020. De onderzoeks-steekproef wijkt slechts gedeeltelijk af van de Nederlandse beroepsbevolking, waarbij er bij de Nederlandse overheidsorganisaties in verhouding meer mannen werken (52%), en deze relatief oud en hoogopgeleid zijn.

Uit de beschrijvende analyse bleek dat de ervaren gezondheid van telewerkers over het algemeen vrij goed was. Wat de fysieke gezondheid betreft, meldde 42,7% van de respondenten geen spier- en gewrichtsproblemen ontwikkeld te hebben en 70,9% van de respondenten meldde geen symptomen te hebben van Sick Building Syndroom (SBS). Zelfs in latere cohorten werd het geestelijk welzijn goed gescoord, aangezien weinig werkstress (μ= 2,47) en uitputting (μ= 2,49) werden gerapporteerd. Desondanks gaven de respondenten aan dat ze het informele contact met hun collega's en het samenzijn in dezelfde fysieke ruimte met hen misten. Hierdoor werden de gevoelens van beroepsmatig isolement iets hoger gewaardeerd (μ= 3,15). Slechts 6,2% van de respondenten meldde zich ziek wegens de gemelde gezondheidsproblemen.

Na de beschrijvende analyse werden bivariate analyses en pad-analyses uitgevoerd. Bivariate- en pad-analyses toonden aan dat geslacht, leeftijd en opleidingsniveau invloed hebben op de tevredenheid over organisatorische en leidinggevende ondersteuning, hun musculoskeletale gezondheid, het lijden aan SBS, werkstress, depressie, uitputting, betrokkenheid, professioneel (sociaal) isolement en zelf-waargenomen productiviteit. Het feit dat de thuiswerkplek gemeubileerd was om kantoor-werkzaamheden uit te voeren en dat de werkplek afsluitbaar was, bleek niet alleen positief effect te hebben op de lichamelijke gezondheid, maar ook op de mentale sociale gezondheid en de zelf ervaren productiviteit.

Het hebben van kinderen, of het samenwonen met anderen, bleek van invloed te zijn op de mentale en sociale gezondheid. De mate van ondersteuning die men ervaart tijdens het telewerken bleek van invloed te zijn op de mentale en sociale gezondheid, waarbij een hoge mate van ondersteuning door de organisatie werd geassocieerd met een positieve invloed op de mentale en sociale gezondheid.

De persoonlijke- en omgevingsfactoren in het model bleken significante relaties te hebben met de zelf waargenomen productiviteit. Echter bleek dat meer dan de helft van de totale effecten van persoons- en omgevingskenmerken op de zelf waargenomen productiviteit werden gemedieerd door de door de fysieke, mentale en sociale gezondheidsaspecten in het model, met uitzondering van de invloed van geslacht en of iemand kinderen heeft op de waargenomen productiviteit.

De resultaten van het huidige onderzoek benadrukken het belang van de fysieke en sociale geschiktheid van de thuiswerkplek voor het succesvol thuiswerken. Daarnaast laat dit onderzoek zien hoe belangrijk het beschermen en bevorderen van de gezondheid op het werk is voor gezond en productief personeel.

Dit onderzoek werd uitgevoerd tijdens de COVID-pandemie lockdown in Nederland. Daarom kunnen sommige bevindingen met betrekking tot de gezondheid van telewerkers vertekeningen of overdrijvingen bevatten, waardoor de generaliseerbaarheid van de resultaten wordt beperkt. De resultaten en interpretaties zijn ook beperkt doordat potentieel invloedrijke aspecten van de fysieke en sociale werkomgeving (bv. binnentemperatuur, verlichting en lawaai), evenals belangrijke aspecten van fysieke, mentale en sociale gezondheid (bv. werktevredenheid en geluk) niet zijn onderzocht. Ten slotte worden de resultaten van dit onderzoek beperkt door de methodologische en praktische beperkingen van Structurele Equation Modelling (SEM) met betrekking tot het gebruik van exogene dichotome variabelen.

De kennis die met het huidige onderzoek is opgedaan, kan worden gebruikt voor verder onderzoek en kan tevens helpen bij het ontwerpen en uitvoeren van een beleid ter verbetering, bescherming en bevordering van de gezondheid op het werk, zowel op kantoor als thuis. Toekomstig onderzoek moet in de eerste plaats proberen de beperkingen van de huidige studie te overwinnen, bijvoorbeeld door ook de niet-geïdentificeerde aspecten van de fysieke en sociale werkomgeving en belangrijke aspecten van fysieke, mentale en sociale gezondheid (zoals in voorgaande paragraaf genoemd) te evalueren. Door deze kenmerken mee te nemen in toekomstig onderzoek kan er een nog uitgebreide inzicht worden verkregen in de invloeden van thuiswerken, en de rol die persoonlijke- en omgevingskenmerken daarin spelen.

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“The world cannot be understood without numbers, and it cannot be understood with numbers alone”.

- Hans Rosling

Factfulness: Ten Reasons We're Wrong About the World and Why Things Are Better Than You Think (2018)

CHAPTER 1

INTRODUCTION

Photo by Olia Danilevich on Pexels.com

CHAPTER 1: INTRODUCTION

1.1 BACKGROUND

Teleworking has become an increasingly popular method of working since the beginning of the twenty-first century. Through telework, employees can perform their normal work activities, while away from one's normal workplace in the office (Grant, 1985). First conceived as a strategy to cope with skyrocketing fuel prices amid the 1973 OPEC oil crisis (BBC, 2020), telework currently helps organizations decrease their real-estate costs and fulfil their employee's needs for a healthy work-family balance (Bailey & Kurland, 2002). As a type of flexible work arrangement or practice (FWP), telework became more popular in the late 1990s, as home computers, laptops, mobile phones and telecommunication software became an everyday work tool (Tavares, 2017). The huge technological advancements since the 1990s have made it easier to work from home these days.

Home-based telework, where work duties are primarily carried out at home, has seen a rise in popularity in the last few years (CBS, 2020c), eventually peaking in 2020 and 2021 as a result of the COVID-19 pandemic. The Dutch government, including the Ministry of Public Health, Welfare and Sport, announced the urgent advice to work from home, when possible, to minimize the spread of the virus. Consequently, within a few weeks, a large proportion of knowledge workers in the Netherlands were working from home.

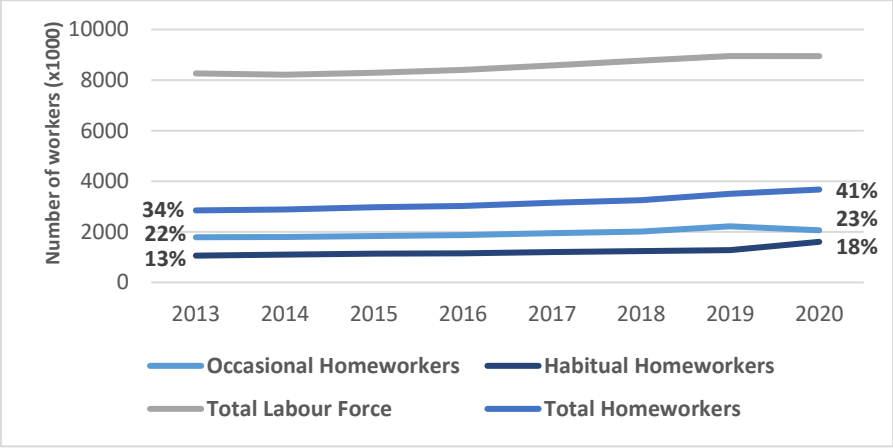


Figure 1 Homeworking among the Dutch Labour Force (source: CBS, 2021)

Research by the Dutch Central Bureau of Statistics (CBS) revealed a significant increase in the number of people teleworking and the extent to which they worked from home: in 2019, 25.3 per cent of the Dutch employed labour force worked from home occasionally (CBS, 2020c). In 2020, it was found that around 41 per cent of the Dutch employed labour force worked from home, either occasionally or most of the time (CBS, 2021). Furthermore, a shift was found from incidental homeworking to working at home on a regular basis (Figure 1).

At first, working from home during the COVID-19 pandemic was well-received by a proportion of teleworkers (Intermediair & Nationale Vacaturebank, 2020; Kennisinstituut voor Mobiliteitsbeleid, 2020). Consequently, sources claimed that this large scale of working from home would continue after the pandemic ended (NRC, 2020; Online, 2020; Trouw, 2020), for example:

- Capterra revealed, through an online survey in April 2020, that 23% of Dutch respondents would like to continue working full-time from home after the crisis (Capterra, 2020);

- Studies by the Dutch Knowledge Institute for Mobility-policies (KiM) revealed that approximately 40-60% of homeworkers expect to stay at home more often when the crisis is over (Kennisinstituut voor Mobiliteitsbeleid, 2020);
- Global Workplace Analytics (2020) predicts that about 25-30% of the workforce will be working from home multiple days a week by the end of 2021.

However, as time went on and teleworkers got sick of obliged telework, the debates about the uncertain future of corporate real estate have shifted to a more realistic view of the future in which the workforce is more 'hybrid' (i.e. alternating between the office and the home). Regardless of the future of telework, this projected increase in working from home (WFH) in the near future calls for extensive research into its effects.

Over the years, several advantages and disadvantages of telework have been revealed. Telework has been identified as having a positive effect on productivity (Bloom et al., 2015), job satisfaction and morale (Felstead & Henseke, 2017), organisational commitment (Bailey & Kurland, 2002), and flexibility (Grant et al., 2013). However, these advantages come at a significant cost, as previous research revealed that telework also has several drawbacks. Teleworkers are found to experience reduced career progression (Mann et al., 2000), increased social isolation (Mann & Holdsworth, 2003), reduced organisational support (Golden & Gajendran, 2019), increased presenteeism (Tavares, 2017), and the blurring of one's work-life boundary (Mann & Holdsworth, 2003).

Previous research has also identified that telework has recognised effects on health (e.g. Ammons & Markham, 2004; Bloom et al., 2015; Nakrošiene et al., 2019; Steward, 2001; Tavares, 2017). The World Health Organisation (WHO) reported that, for most countries, work-related health problems in various sectors resulted in an economic loss of 4–6% of Gross Domestic Product (GDP), in which workplace health initiatives can help reduce sick leave absenteeism (= absence from work) by 27% and health-care costs for companies by 26% (WHO, 2017). Whether teleworking has an overall positive or negative effect on health is still undetermined, especially when working from home full-time, since the benefits of telework are dependent on its intensity, and few studies concentrated on full-time homeworkers. Tavares (2017) discussed the recognized health problems associated with telework in detail, and categorized them into four groups: 1) musculoskeletal problems, 2) (social) isolation and depression, 3) stress and overwork, and 4) others. Tavares (2017) emphasized the need to investigate the relationship between performance and health outcomes while teleworking, particularly the health outcomes that are associated with depression and stress, as these are under-investigated.

1.2 PROBLEM STATEMENT

In normal circumstances and in general, working from home is considered to be beneficial for employee attitudes, health and performance. However, the current conditions regarding the COVID-19 lockdown are considered less beneficial, and possibly even harmful, for the performance and health of teleworkers.

First, previous research has found that telework is beneficial for teleworker health and performance, as employees can self-select whether they want to telework based on personal preferences and circumstances. Furthermore, employees can often return to the office when dissatisfied with telework, and vice versa (Ammons & Markham, 2004). Moreover, other instances of self-selection are found, in which family-orientated employees are more drawn to telework as they can spend more time with their family and take care of them when working from home (Mokhtarian et al., 1998; Standen et al., 1999). Also, workers with suitable at-home workspaces and sufficient social support are more likely to choose to work from home, compared to those who do not (Thorstensson, 2020; Troup & Rose, 2012).

Consequently, employees who think of adopting telework are considered to make complex trade-offs, as discussed by Tavares (2017):

"*Workers face a cost-benefit trade-off when doing telework. There is a general view that it results in a net benefit for workers and has a positive effect on their health. This is mainly because there is less stress and a better work-family life balance"* (p. 34).

In the case of the COVID-19 pandemic, employees do not have the luxury to return to the office when dissatisfied with telework. Following this concept of self-selection, these employees are likely ill-equipped for telework through being less disciplined or having no suitable workspace in their home.

Second, previous research has also revealed an effect of telework intensity (= the time spent working from home, compared to in the office) on teleworker health and productivity. Research suggests that low- and middle-intensity teleworkers have reduced predicted health risks and increased productivity, while non-teleworkers and high-intensity teleworkers had higher predicted health risks (Henke et al., 2016; Hoornweg et al., 2016). The current study adds to the current knowledge regarding telework intensity and its relationship with health and productivity.

Lastly, the Joint Research Centre (2020) argues that the advantages of telework (such as enhanced flexibility, productivity, and a better work-life balance) have become less prominent due to the COVID-19 pandemic. Furthermore, it is suggested that the disadvantages of telework are possibly enhanced:

> "*… under the current exceptional circumstances, productivity, working conditions, or both, may be deteriorating for many workers due to, among other problems, lack of childcare, unsuitable working spaces and ICT tools"* (Joint Research Centre, 2020, p. 8).

Studies aiming at the identification of the relationships between personal and environmental factors of teleworkers and their respective health and/or productivity are not new in research literature, as several studies identified the significance of personal and environmental characteristics concerning telework outcomes (e.g. Ammons & Markham, 2004; Bailey & Kurland, 2002; Bloom et al., 2015; Mann & Holdsworth, 2003; Nakrošiene et al., 2019; Troup & Rose, 2012). However, the influence of the current exceptional circumstances of the COVID-19 pandemic, as well as the incompatibility of some employees with telework, has yet to be investigated in relation to teleworker health and productivity. While previous research tends to focus on the differences between office workers and teleworkers on either health or productivity, this research aims to find out which, and to what extent, the personal and environmental characteristics of obliged teleworkers affect their health and productivity.

These observations result in the following problem statement:

> *Telework has recognised effects on health and productivity. However, currently, there is insufficient knowledge on obliged telework and the effects of personal- and environmental factors of (almost) full-time home-based teleworkers on their health and productivity during the COVID-19 pandemic.*

To investigate these relationships, the person-environment fit model is chosen as an approach: Kurt Lewin's (1936) person-environment fit (PE-fit) framework states that an individual's behaviour is a function of both the person and their environment. It is claimed that each individual has their preferences regarding their (work)environment and that whenever one works within their most compatible work environment it may lead to improved work attitude, performance, and reduced stress (Kristof-Brown et al., 2005).

1.3 RESEARCH QUESTIONS

The main question in this research is defined as follows:

Which personal- and environmental factors are related to employee health and productivity when working (almost) fully from home during the COVID-19 pandemic, and how does health mediate these relationships?

To answer this question, sub-research questions are determined. These sub-questions are accompanied by the preliminary conceptual model (Figure 2), in which the numbers in the model represent their respective sub-question. Sub-questions 5 and 6 are not presented in the conceptual model but instead are answered through individual analyses.

Each of the following sub-questions is discussed and answered in the remainder of this thesis:

1) Which personal characteristics of home-based teleworkers are related to their environment, health and productivity during the COVID-19 pandemic?
2) Which physical and social environmental characteristics of home-based teleworkers are related to their health and productivity during the COVID-19 pandemic?
3) How do the physical, mental, and social health of home-based teleworkers relate to each other?
4) How are the health of home-based teleworkers and their productivity related to each other during the COVID-19 pandemic?
5) To what extent do physical, mental and social health mediate the effect of personal and/or environmental characteristics on productivity?
6) Which perceived changes in the environment of teleworkers might explain the experienced deterioration of physical, mental and/or social health while working from home during the COVID-19 pandemic?

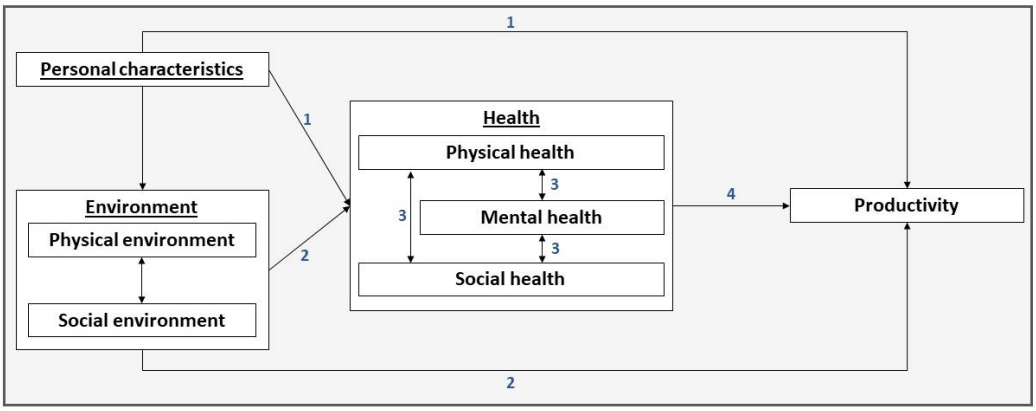


Figure 2 Preliminary conceptual model

1.4 RESEARCH DESIGN

This research is divided into three sections. The first part consists of a literature review, the second part consists of quantitative research, and in the last part, the findings of the previous sections are discussed.

The first section of this research consists of a review of the existing literature regarding telework and its effects on health and productivity. This part aims to define the concepts of telework, health, and productivity, assess the current knowledge on telework, discuss several outcomes of telework, and identify personal- and environmental factors that influence telework outcomes.

The second section of this research consists of quantitative research on home-based teleworkers who were obliged to work from home due to the COVID-19 pandemic. Two suitable datasets, provided by the 'We Werken Thuis' (later on referred to in English as 'We Work from Home') research project, will be used to conduct the quantitative research. Specifically, the data from week 3 and week 7 (containing 25,058 and 18,859 valid responses, respectively*)* will be used.

The questionnaires of these weeks will be used as they discuss the different themes of this research:

- *the personal characteristics of the respondent;*
- *the characteristics of the respondent's physical and social environment;*
- *the self-reported health of the respondent;*
- *the degree of perceived social cohesion of the respondent;*
- *the respondent's perceived productivity;*
- *the relationship between the health and productivity of home-based teleworkers.*

The datasets are analysed through descriptive analyses, bivariate analyses and path analysis. Consequently, the relationships between variables can be determined and used to answer the various research questions. Afterwards, conclusions are drawn regarding the effects of personal- and environmental characteristics on the health and productivity of home-based teleworkers, the health-productivity relationship, and other findings from the current research. Lastly, the limitations of this research are discussed, and recommendations for future research are presented.

1.5 RELEVANCE

1.5.1 PRACTICAL RELEVANCE

Understanding the effects of telework and identifying the roles of personal and environmental factors on teleworker health and perceived productivity, is important in aiding decision-making processes to support healthy work practices from an organisational perspective and an individual perspective. First, from the individual perspective, healthy employees have a greater capacity to enjoy life both inside and outside the workplace and are more productive. Furthermore, healthy workplace practices are related to improved morale, job satisfaction and motivation (Grawitch et al., 2006).

As stated briefly in Section 1.1, occupational health plays a large role in the efficiency of an organisation and its employees, as work-related health problems are found to result in a significant economic loss (World Health Organisation, 2017).

From an organisational perspective, supporting employees in working safely and in a healthy way is found to reduce ill-health and absence while improving job performance, leading to improved business results (Merrill et al., 2012). Investing in workplace health initiatives can help reduce sick leave absenteeism by 27% and healthcare costs for companies by 26% while improving job performance, satisfaction and motivation (Grawitch et al., 2006; Merrill et al., 2012; World Health Organisation, 2017). Employees can use the insights provided in the current research to educate themselves on the importance of occupational health and to encourage them to take care of their mental and physical health by being physically active and taking time to unwind after work as a means to maintain productivity, job satisfaction, and to reduce the risk of burn-out.

By identifying the roles of personal and environmental factors on health and perceived productivity, this study aims to aid the decision-making process of organisations that consider implementing telework practices or think of investing in workplace health policies. Consequently, facility managers, workplace managers, and human resource managers can use these insights to improve their company's attitude and policies towards home-based telework – as the attitude and policies might affect the job satisfaction, turnover intentions and productivity of teleworking employees (Kröll & Nüesch, 2019;

Soetman, 2011; Thorstensson, 2020). Furthermore, the knowledge gained from this research supports organisations in updating their company's policies to better assist their employees in responsibly working from home.

1.5.2 SCIENTIFIC RELEVANCE

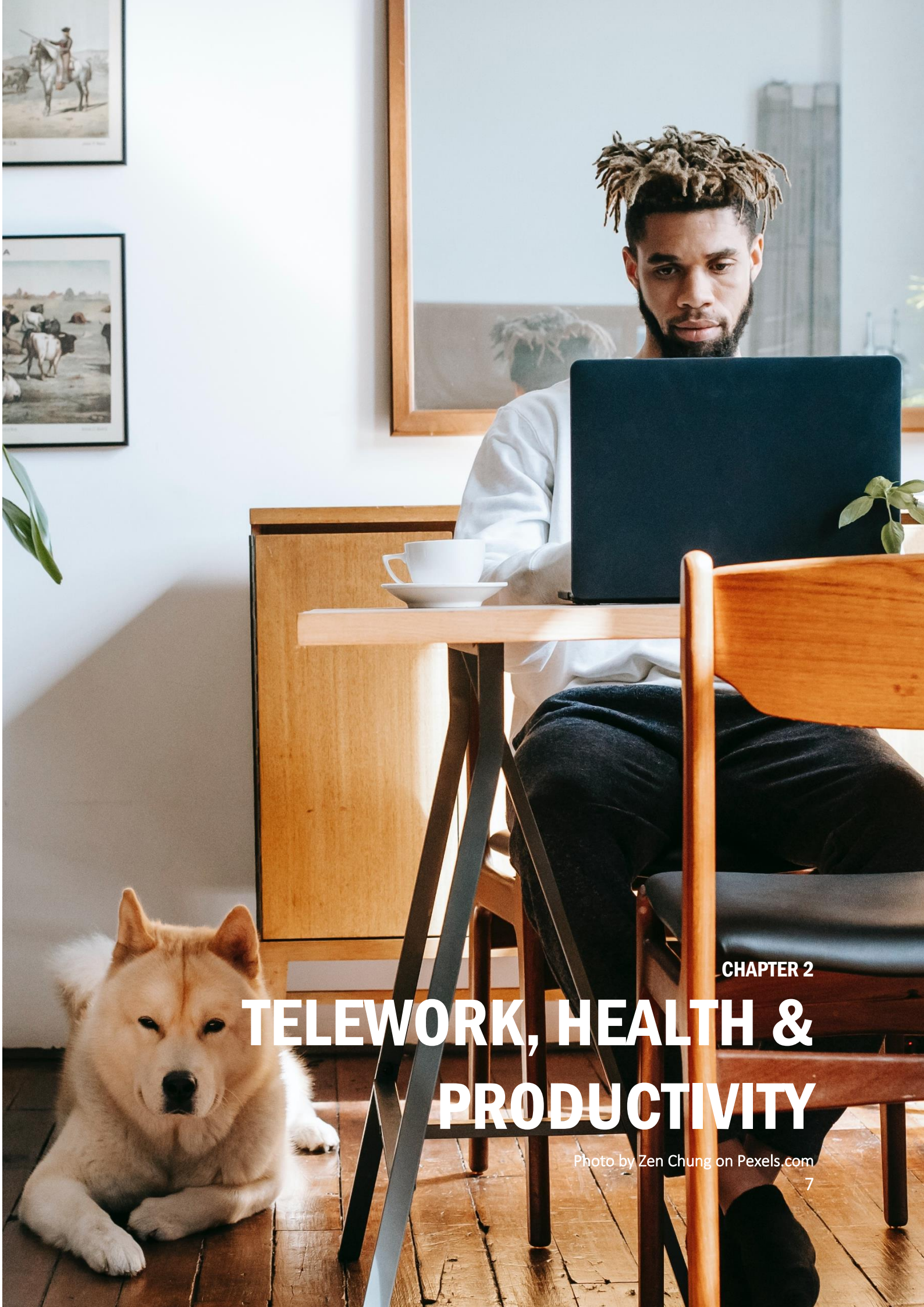
This study approaches telework research from several unique angles. First, as explained in Section 1.2, this research is conducted in the exceptional circumstances of the COVID-19 pandemic in which knowledge workers are obliged to work from home full-time, even when their home situation is found to be inadequate for telework. Therefore, it is considered possible that the effects of teleworking in previous studies may have been underestimated, as workers were not away from the office frequently enough or for long enough periods (Bailey & Kurland, 2002).

Second, this study is unique due to the size and structure of the dataset. The dataset, provided by the 'We Work from Home' research project, includes data from 25,058 and 18,859 respondents, which is a much larger dataset compared to other studies (Bloom et al., 2015; Kröll & Nüesch, 2019; Nakrošiene et al., 2019). Furthermore, it was found that previous studies on home-based teleworkers only included a few personal- and environmental characteristics in their analysis study (Ammons & Markham, 2004; Bloom et al., 2015; Kröll & Nüesch, 2019; Nakrošiene et al., 2019; Ward, 2017). The current research, however, analyses the influence of these factors on teleworker health and productivity through a more extensive list of characteristics, while also analysing various aspects of physical, mental, and social health. Therefore, the current research allows for a more accurate identification of the relationships in the model.

Although there have been various studies discussing the relationship between health and productivity in the context of the traditional office (Boles et al., 2004; Wolf, 2010), only a few studies have discussed this relationship in the context of home-based telework. This conclusion is supported by Tavares (2017), who emphasized the need to investigate the relationship between productivity and health outcomes in a telework context, as it is a rarely researched topic. Particularly, few studies can be found that analyse the health-productivity relationship when telework is performed full-time. Tavares (2017), who emphasized the need to investigate the relationship between productivity and health outcomes, as it is an under-investigated topic. Particularly, few studies can be found that analyse the health-productivity relationship when telework is performed full-time.

While previous research has included individual aspects of the definition of health in their study or discussed health in general (e.g. Ammons & Markham, 2004; Bloom et al., 2015; Kröll & Nüesch, 2019; Mann & Holdsworth, 2003; Thorstensson, 2020), this study aims to investigate the relationships between personal and environmental characteristics of teleworkers and the complete definition of health, as defined by the World Health Organisation (1948). This definition contains aspects of physical, mental and social well-being.

In conclusion, this research provides several unique insights regarding the health and productivity of home-based teleworkers. Consequently, this research can help to contribute to the state-of-the-art regarding telework research, occupational health research, and PE-fit research.



CHAPTER 2

TELEWORK, HEALTH & PRODUCTIVITY

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CHAPTER 2: TELEWORK, HEALTH & PRODUCTIVITY

The previous chapter provided a brief overview of telework in relation to occupational health and productivity, while also identifying the research gap. It was found that the limited knowledge on how personal and environmental characteristics affect obliged full-time teleworkers calls for extensive research on the subject, especially since so many individuals are teleworking as a result of the COVID-19 pandemic.

This chapter aims to define the concepts of telework, health and productivity, and to identify how telework affects the health and productivity of teleworkers. First, telework is defined, followed by an overview of how the physical, mental and social health of teleworkers is affected by telework. After this, the relationship between telework and productivity is discussed. Last, the relationship between health and productivity is discussed in more detail.

2.1 TELEWORK

As briefly discussed in the introduction, in the early 1970s, the topic of telework started to gain popularity as a research topic. As a method to cope with the skyrocketing fuel prices due to the 1973 OPEC oil crisis, telework offered an alternative to the costly commute to the office (BBC, 2020; Gregg & Wadsworth, 1999; Haddon & Brynin, 2005). It was found that, without going to the office, employees were still able to perform their normal work activities (Grant, 1985). Telework regained traction in the 80s and 90s, after being side-lined when the oil crisis was over. Organisations, as well as management and business researchers, found that teleworking offered other benefits to telework, such as being able to adapt to market changes more easily through flexible deployment and to reduce real estate costs (Gregg & Wadsworth, 1999; Madsen, 2003).

Throughout the years, telework has been defined in various ways. One of the first authors to define telework characterized teleworking as one kind of remote working or doing normal work activities while away from one's normal workplace (Grant, 1985). Consequently, as this definition was found to be arguably broad, the definition by Grant (1985) was expanded by Gray et al. (1993). This newer definition included aspects of space, time and its support by information and communication technologies:

> *"Teleworking is a flexible way of working which covers a wide range of work activities, all of which entail working remotely for an employer […] for a significant proportion of work time. Teleworking may be on either a full-time or part-time basis. The work often involves electronic processing of information, and always involves using telecommunications to keep the remote employer and employee in contact with each other"* (Gray et al., 1993, p. 2).

Following the definition of the concept of telework, four classifications or categories of telework were created, as discussed by Daniels et al. (1997):

1) Home-based telework: work duties are carried out at home, where work can involve both high-skilled and low-skilled tasks;
2) Teleworking from remote offices: work duties are carried out at offices that are remote from the main office (satellite offices), telecentres, or at telecottages;
3) Mobile telework: work duties are performed by people who sometimes work away from their normal working base (the traditional office, satellite office, or at home), and whose work involves regular travel and/or spending time on customers' premises (common in sales and consulting);
4) Ad hoc teleworking: office-based staff use computers and telecommunications, allowing them to work from home under certain well-defined circumstances. This category includes all types of staff who work from home occasionally.

Following this classification, CBS (2020) found that, in 2019, 'ad hoc teleworking' was the most common method of teleworking in the Netherlands: 25.3 per cent of the Dutch employed labour force worked from home incidentally. Recent health and safety measures related to the COVID-19 pandemic has accelerated this trend of telework, by forcing a large group of the labour force to shift towards full-time home-based telework, as can be seen in **Figure 1** (CBS, 2020d).

2.2 HEALTH

The occupational well-being of employees is very important as it affects absenteeism, presenteeism, stress, quality of life, job satisfaction, employee morale, and staff retention (e.g. Horst et al., 2014; Merrill et al., 2012; Vittersø et al., 2003). Furthermore, workplace health promotion is expected to result in increased productivity, increased organizational effectiveness and the potential of a return on investment (World Health Organisation, 2002, 2017).

Health is considered a resource to support an individual's functioning in wider society. The World Health Organisation (WHO) defines 'health' as *" a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity"* (WHO, 1948). Previous research has found that telework has an impact on all three aspects of health, in which telework was found to have both positive and negative effects on health. On the one hand, the positive effects of telework on health are often related to the flexibility that telework provides (Tavares, 2017). While on the other hand, negative effects of telework are found to be associated with poor musculoskeletal health due to long periods of continuous and repetitive seated work (Crossan & Burton, 1993; Skov et al., 1996; Standen et al., 1999; Tavares, 2017). In addition to poor musculoskeletal health, telework is also found to contribute to social isolation, depression and other mental health issues related to stress (Ammons & Markham, 2004; Mann & Holdsworth, 2003; Standen et al., 1999; Tavares, 2017; Ward, 2017).

Whether someone experiences health benefits from telework was found to be dependent on the time spent working from home, compared to in the office, often referred to as 'telework intensity'. Research by Gajendran and Harrison (2007) found that workers who worked from home occasionally, or just 1 to 2 days per week, experienced the most health benefits. Furthermore, Henke et al. (2016) also identified a U-shaped relationship between telework intensity and health risks, such as depression, poor nutrition, and physical inactivity (**Figure 3**). The study revealed that middle-intensity teleworkers (9-32 hours per month) had the lowest predicted health risks. Conversely, non-teleworkers and very high-intensity teleworkers (>73 hours per month) had higher predicted health risks (Henke et al., 2016).

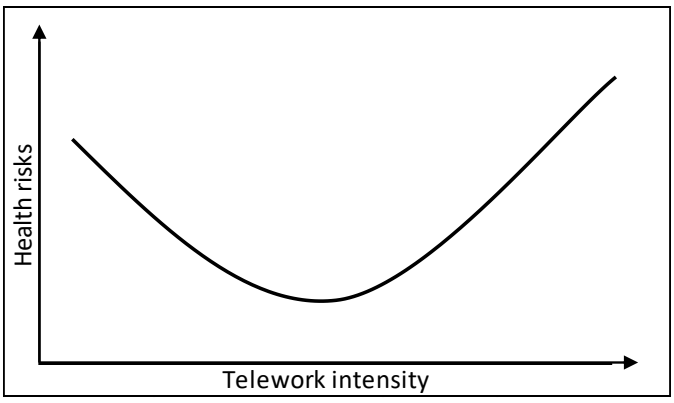

Figure 3 Relationship between telework intensity and health risks (Henke et al., 2016)

According to WHO (2020), regular physical activity is beneficial for both physical and mental health, as it is associated with improved all-cause mortality, cardiovascular disease mortality, incident hypertension, cancers, diabetes, mental health, and sleep. Therefore, it is recommended that adults undertake at least 150–300 minutes of moderate-intensity aerobic physical activity throughout the

week, in other to obtain health benefits. Regarding sedentary behaviour, it is recommended to limit the amount of time spent being sedentary to obtain health benefits (World Health Organisation, 2020).

2.2.1 PHYSICAL HEALTH

Physical health is the state of one's physical body and how well it is operating. The importance of a healthy lifestyle is most apparent in the concept of physical health: an individual with good physical health is likely to exercise regularly, has balanced nutrition, and rests sufficiently – all contributing to good physical health (WHO, 2018b, 2021). Being physically active reduces the probability of getting actual physical pain, as well as the risk of heart diseases, type 2 diabetes, and some cancers (National Cancer Institute, 2020).

An extensive literature review of telework and its effects on health by Tavares (2017) identified that physical health issues, as a result of telework, are often related to working long hours behind a computer without regular breaks and poor ergonomics. Other physical health problems, which were not discussed by Tavares (2017), such as headaches, irritation of the eyes, nose and/or throat, and concentration problems, are considered to be the result of poor indoor air quality (IAQ), among other reasons. Therefore, these health problems are classified as Sick Building Syndrome-related health problems (Camfil, 2020; Joshi, 2008; United States Environmental Protection Agency, 1991).

2.2.1.1 MUSCULOSKELETAL DISORDERS

The Centers for Disease Control and Prevention (2020) describes musculoskeletal problems as "injuries or disorders of the muscles, nerves, tendons, joints, cartilage, and spinal discs". Even though musculoskeletal problems can occur in both the traditional workplace and the at-home workplace (Besharati et al., 2020), there is an increased risk of musculoskeletal problems when working from home (Crossan & Burton, 1993; Standen et al., 1999). Tavares (2017) described how computer work, when performed at home, is associated with a static and constraining posture, repetitive movements, extreme positions of the forearm and wrist, and with long periods of continuous work - resulting in musculoskeletal disorders.

Crossan & Burton (1993) identified that working from home causes health and safety problems as a result of cramped work space, noise, insufficient work breaks or poor ergonomics. Poorly designed workplaces influence an employee's physical health through ergonomics: e.g. an unsuitable chair or desk can cause poor posture, which could prove very harmful in the long run (Beauregard et al., 2019; Crawford et al., 2011; Tavares, 2017).

In addition to poor ergonomics of the at-home workspace, telework has revealed that teleworkers take fewer health breaks (e.g. informal socializing with colleagues) which are important for musculoskeletal relaxation (Crossan & Burton, 1993; Tavares, 2017). Therefore, it is found that physical activity and sedentary behaviour (which includes most desk-based office work, driving a car, and watching television) are important indicators of musculoskeletal health. Regular physical activity is also found to postpone or prevent musculoskeletal disorders, such as mechanical low back pain, neck pain and shoulder pain (Vuori, 1995). Furthermore, physical activity contributes to the rehabilitation of musculoskeletal disorders. Thus, whether a teleworker exercises regularly is an important predictor of the physical health of home-based teleworkers.

2.2.1.2 HEALTH PROBLEMS RELATED TO SICK BUILDING SYNDROME

Several other physical health problems are classified as not being related to the ergonomics of the (at-home) workplace. Various health problems are considered to have a similar root cause, called 'Sick Building Syndrome' (SBS). Sick Building Syndrome is defined as "*situations in which building occupants experience acute health and comfort effects that appear to be linked to time spent in a building, but no specific illness or cause can be identified"* (United States Environmental Protection Agency, 1991).

Even though no specific cause can be identified, there is evidence that a combination of factors may be responsible for this health problem, which is bad indoor air quality through poor ventilation, and biological and chemical pollutants that are present in the air (Camfil, 2020). Feelings of ill-health as a result of SBS include dizziness, nausea, headaches, irritation of the eyes, nose and/or throat, concentration problems, and fatigue, among many others (Camfil, 2020; Joshi, 2008; United States Environmental Protection Agency, 1991). Furthermore, the feelings of ill-health result in an increase in sickness absenteeism (= absence from work) and a decrease in productivity of the workers (Joshi, 2008).

Symptoms of SBS increase in severity with time spent in sick buildings, while decreasing in severity in non-work periods such as holidays, weekends, and evenings (Redman et al., 2011). This statement by Redman et al. (2011) suggests that the factors that are responsible for this syndrome are not present at the home location. However, despite being called an 'office illness' (Wang et al., 2013), it is also possible to suffer from SBS symptoms at home: as changes in building design for improved energy efficiency resulted in modern homes and offices becoming more airtight compared to older structures, causing poor ventilation and indoor air quality (Jones, 1999).

Telework eliminates the travel time normally needed to get to the office, reduces the time and number of health breaks, and increases the amount of screen-time of teleworkers (Crossan & Burton, 1993; Tavares, 2017). Effects of increased ICT use include increased levels of computer vision syndrome, which is a set of vision-related problems resulting from prolonged ICT use, such as headaches or eyestrain (Eurofound, 2020). The American Migraine Foundation (2020) found that around 85 per cent of people with migraine headaches experience sensitivity to light, particularly the blue-tinted light emitted from computer screens and phone screens.

The European Foundation for the Improvement of Living and Working Conditions (Eurofound, 2020) analysed the differences in health problems per work arrangement and found that 60 per cent of individuals performing telework and ICT-based mobile work (TICTM) reported headaches and eyestrain. In comparison, only around 30 and 40 per cent of workers with low ICT use and high ICT use in the traditional office reported the same physical health problems (Figure 4). Furthermore, the share of workers reporting headaches and eyestrain decreased whenever telework intensity decreased. Therefore, these findings suggest that high ICT use, combined with high telework intensity result in a larger probability of experiencing symptoms of Sick Building Syndrome.

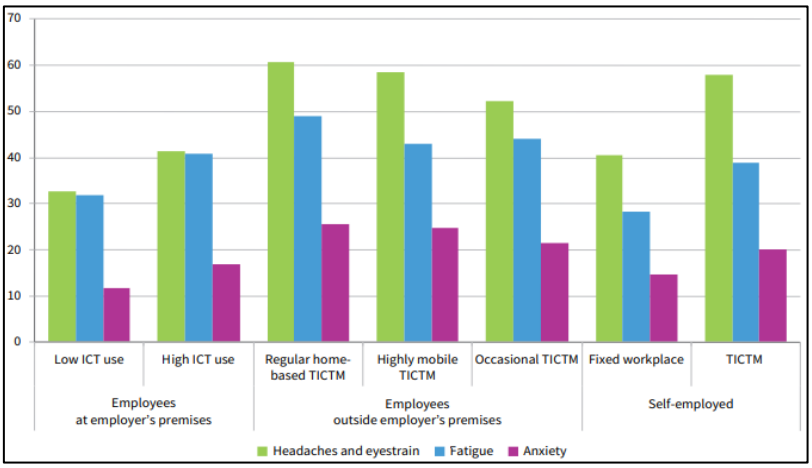

Figure 4 Share of workers reporting fatigue, headaches, eyestrain and anxiety by work arrangement (Eurofound, 2020)

2.2.2 MENTAL HEALTH

According to the World Health Organisation (2019), "*Mental health is a state of well-being in which an individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively, and is able to make a contribution to his or her community".* Determinants of mental health and mental disorders include individual attributes such as the ability to manage one's thoughts, emotions, behaviours and interactions with others, but also social, cultural, economic, political and environmental factors; while stress, genetics, and nutrition are also contributing factors to mental disorders (World Health Organisation, 2019).

Mental health is considered to be an integral and essential component of health. Home-based telework raises many questions about the psychological well-being of a teleworker, as work and family life are more intertwined (Standen et al., 1999). Furthermore, research by Boegheim (2020) identified the indoor environmental quality of the home (e.g. air quality, thermal comfort, lighting, noise) as another determinant of workplace mental health, as well as productivity when working from home.

An extensive literature review on the mental and physical health effects of working at home by Oakman et al. (2020) found that telework could have negative or positive impacts, depending on various systemic moderators such as the demands of the home environment, level of organisational support, and social connections external to work. The study identified that stress, quality of life, well-being, and depression are affected by telework. Other studies also identified engagement as an important aspect of the mental wellbeing of teleworkers, as work engagement is found to be associated with mental health (Demerouti et al., 2010; Schaufeli & Bakker, 2004b; Tisu et al., 2020), productivity (Tisu et al., 2020), as well as organisational commitment (Appel-Meulenbroek et al., 2020; Demerouti et al., 2010).

2.2.2.1 (OCCUPATIONAL) STRESS

Stress is difficult to define because it is highly dependent on individual characteristics. Although various definitions of stress have been composed throughout the years, stress is often referred to in behavioural sciences as the *"perception of threat, with resulting anxiety discomfort, emotional tension, and difficulty in adjustment"* (Fink, 2009, p. 4).

Occupational stress is considered to be the pressure that is experienced by individuals due to their job/work, resulting in a harmful physical and emotional response that occurs when job requirements do not match with the employees' capabilities, resources, and needs (National Institute for Occupational Safety and Health, 1999). Consequently, high levels of occupational stress have been demonstrated to be associated with increased rates of heart attack, hypertension, obesity, addiction, anxiety, depression and other disorders (Fink, 2009).

Telework is found to be associated with (the perception of) flexibility, which reduces stress. According to Tavares (2017), there is a framework for a link between work-flexibility (that comes with telework) and health following stress-response theory: *"This flexibility reduces exposure to some stressors since workers are better able to control their lives, reduce family conflict and improve family-work balance while providing resources to enable workers to respond to stressors and so to prevent negative impacts of stress on health"* (Tavares, 2017, p. 34). This finding is supported by Mann and Holdsworth (2003) as they found home-based teleworkers also experienced a decrease in stress due to the perception of having control over their work environment and schedule. Mann and Holdsworth (2003) argued that telework might also be associated with reduced stress, due to the physical separation of office politics and the elimination of transport to the office - as travelling to work significantly increases stress levels of employees. However, various other studies claim the opposite (e.g. Palumbo, 2020; Shukla & Srivastava, 2016; Song & Gao, 2018; Tavares, 2017).

Telework creates stress related to factors such as overwork, tight deadlines, intense and long working hours, inability to switch off and less time to rest (Shukla & Srivastava, 2016; Tavares, 2017). Occupational stress contains four dimensions, according to Shukla and Srivastava (2016), consisting of *1) job stress 2) role expectation conflict; 3) co-worker support and 4) work-life balance*. Job stress is associated with job-related issues such as deadlines, role expectation conflict is associated with demands and expectations of supervisors and colleagues, co-worker support is related to feedback and assistance of colleagues, and work-life balance is related to the compatibility and balance of work and non-work activities. Dimensions 1 and 4 are discussed in more detail below as they play a large role in the remainder of the current study.

JOB STRESS

Research by Mann and Holdsworth (2003) identified the emotional experiences of teleworkers and office workers and found that both teleworkers and office workers experienced a significant amount of stress, due to job-related issues such as deadlines (time-stress). Moreover, office workers also experienced a significant amount of stress from commuting. Time-stress is also found to be related to the dual responsibilities and work-family conflicts which are often found during telework, as time spent on home tasks and responsibilities spill over into work time (Ammons & Markham, 2004; Madsen, 2003)

Mann and Holdsworth (2003) also identified that teleworkers experienced more worry and guilt as a result of telework compared to office workers, in which worry was associated with lack of support and guilt with spending time on non-work tasks during work hours and the expectations of the organisation regarding increased productivity due to telework. Presenteeism is found to be related to job stress, as people feel unable to take time off from work because of sickness (Boles et al., 2004; Mitchell & Bates, 2011).

The effect of telework on job stress remains controversial. On the one hand, telework is considered to increase job stress, while on the other hand telework allows individuals to reallocate time to engage in more leisure activities, which are found to reduce job stress (Guimaraes & Dallow, 1999). However, due to the current situation regarding the COVID-19 pandemic, additional stress and worry are expected among teleworkers (i.e. regarding their health and safety). Moreover, the current situation also prevents individuals from engaging in these stress-reducing leisure activities.

WORK-LIFE BALANCE

Several definitions of work-life balance have been introduced over the years. In the current research, Kalliath and Brough's (2008) definition is used, in which the work-life balance consists of "*the individual's perception that work and non-work activities are compatible and promote growth in accordance with an individual's current life priorities"* (p. 326). This definition includes concepts such as the satisfaction with the work-family balance, as well as the extent to which one can balance the needs of their job with the needs of their family life.

Recent research by Palumbo (2020), regarding the effects of working from home on work-life balance, found that home-based telework is negatively associated with one's work-life balance: *"Working from home was found to be negatively and significantly related to work-life balance. […], home-based telecommuters were more likely to experience both work-to-life and life-to-work conflicts"* (p. 783).

Research by Mann and Holdsworth (2003) revealed that the blurring of boundaries between work and home life may lead to feelings of frustration, anger and stress, as other family members have difficulty in distinguishing the work role from the family role. Song & Gao (2018) revealed similar findings, in which telework results in a higher level of stress, possibly due to increased conflicting demands of work versus the home. Working from home is found to be associated with conflicts between work demands and

family demands, such as the intrusion of family members during work, overwork, and the inability to switch off (Shukla & Srivastava, 2016; Tavares, 2017), consequently resulting in decreased satisfaction with the work-family balance. Therefore, it was found that poor work-life balance is related to high levels of job stress, resulting in high occupational stress.

2.2.2.2 DEPRESSION

According to the World Health Organisation, depression is a common mental disorder that is associated with depressed mood, loss of interest or pleasure, decreased energy, feelings of guilt or low self-worth, disturbed sleep or appetite, and poor concentration – interfering with a person's everyday life (Marcus et al., 2012; WHO, 2018b). Even though depression is experienced differently among individuals, in many cases depression is found to interfere with daily work, which may cause lower productivity – and which could cost employers an estimated $44 billion each year in lost productivity (Center for Workplace Mental Health, 2021).

The Center for Workplace Mental Health (2021) stated that employers can play a key role in supporting the early identification of depression, claiming that when depression is effectively addressed in the workplace, it promises to lower total medical costs, increase productivity, reduce absenteeism and decrease disability costs. Telework makes early identification of depression more difficult, as there is a physical boundary between employees and their co-workers and managers, and conversations between colleagues may become less personal (e.g. Mann & Holdsworth, 2003; Standen et al., 1999; Thorstensson, 2020).

Depression is found to be associated with telework: research by Henke et al. (2016) found that employees who worked from home 8 hours per month or less, were at a smaller risk of depression symptoms than non-teleworkers. Furthermore, Kossek et al. (2006) found that telework is associated with higher rates of depression compared to office workers. These findings suggest that telework intensity is related to depression, in which low telework intensity is associated with reduced risks of depression compared to office workers, while high telework intensity results in increased risks of depression. Depression is found to be strongly related to stress and social isolation (Bailey & Kurland, 2002; Henke et al., 2016; Tavares, 2017) therefore making it difficult to determine whether telework and depressive symptoms are directly related, or indirectly through increased social isolation.

2.2.2.3 FATIGUE, TIREDNESS AND EXHAUSTION

Fatigue is associated with the depletion of physical energy (= tiredness) and emotional and mental energy (= exhaustion) (Oakman et al., 2020).

Telework is associated with reduced tiredness, as a part of physical tiredness (Bloom et al., 2015; Fairweather, 1999; Song & Gao, 2018; Thorstensson, 2020; Ward, 2017). Research by Song & Gao (2018) revealed how telework reduces tiredness, most likely because of the time/energy saved on commuting, greater flexibility, increased autonomy, and the potentially higher productivity from telework.

Exhaustion has been defined as the depletion of emotional and mental energy (Moore, 2000). Previous research indicated that exhaustion in the workplace occurs when individuals are not able to cope with the work demands (Sardeshmukh et al., 2012). Research by Sardeshmukh et al. (2012) found that similar to tiredness, telework is apt to be associated with decreased exhaustion, as teleworking saves emotional energy and time through the avoidance of a commute. Furthermore, distractions in the workplace were found to be related to increased exhaustion through individual strain (Appel-Meulenbroek et al., 2020).

Conflicting results are found regarding the effect of telework on fatigue itself, as identified by Oakman et al. (2020). Out of four studies reviewed by Oakman et al. (2020), two studies reported that working

from home was associated with decreased fatigue, compared to those working in the office, while one study found that telework associated with increased fatigue in teleworking mothers.

2.2.2.4 ENGAGEMENT

Previous research has defined (job) engagement in various ways: Maslach et al. (2001) characterises job engagement as energy, involvement and efficacy when performing your job. Schaufeli and Bakker (2004a) defined engagement as a persistent, positive affective-motivational state of fulfilment in employees that is characterised by vigour, dedication and absorption. Previous research found that work engagement is positively related to employee productivity (Hanaysha, 2016). Research by Appel-Meulenbroek et al. (2020) found that work engagement in activity-based workplaces is associated with high levels of energy, pleasure, activation and commitment, openness to new experiences, and creativity.

Wiesenfeld et al. (1999) found that high-intensity teleworkers identify less with the organisation they work for as they are physically and psychologically separated from their workplace: the more intensively one teleworks, the fewer times the teleworker is reminded of their belonging to the organisation due to physical cues such as symbols, buildings and office décor being absent from their daily routine. Furthermore, teleworkers that experience a lack of social support from colleagues and managers, and telework intensively, are more likely to experience lower job involvement and job engagement (Schaufeli & Bakker, 2004).

2.3.3 SOCIAL HEALTH

Keyes (1998) described social well-being as the appraisal of one's circumstances and functioning in society. In the same study, Keyes (1998) proposed five dimensions of social well-being: (1) social integration, (2) social acceptance, (3) social contribution, (4) social actualization, and (5) social coherence. Whenever an individual is not satisfied with either of these five dimensions, it may result in poor social well-being. For example, lacking social integration for a long period can cause an individual to experience chronic loneliness (Keyes, 1998).

Due to the nature of telework, working at home instead of at the traditional office, teleworkers are limited in establishing a social work relationship with colleagues, compared to office workers (Tavares, 2017). In telework literature, social isolation is found to be one of the biggest disadvantages of telework (Ammons & Markham, 2004; Bloom et al., 2015; Mann et al., 2000; Mann & Holdsworth, 2003; Thorstensson, 2020; Ward, 2017). Moreover, in many studies, respondents cite isolation as the primary reason why they do not want to telework full-time (Bloom et al., 2015; Cooper & Kurland, 2002).

Studies have identified that being unable to meet with colleagues physically and being far from the physical office, combined with long, continuous working hours can induce feelings of loneliness and isolation (Bailey & Kurland, 2002; Grant et al., 2013; Mann & Holdsworth, 2003; Skov et al., 1996). It is therefore important that the relationships with colleagues are maintained during telework, in order to support the psychological well-being of teleworkers (Grant et al., 2013).

Research by Mann et al. (2000) found that 57 per cent of teleworking employees reported some kind of social isolation when teleworking. However, it was revealed that there are both positive and negative aspects to social isolation when teleworking: positive aspects of social isolation are related to having a quiet private space to work with no interruptions (Grant et al., 2013), whereas negative aspects are related to feelings of loneliness (Bloom et al., 2015; Mann & Holdsworth, 2003). Bloom et al. (2015) revealed similar findings: the experiment, consisting of 3 groups (control group, volunteer and non-volunteer treatment-group), found that more than 50% of the volunteer group and 10% of the non-volunteer group moved back to the traditional office after the experiment *"primarily because of feeling isolated and lonely at home"* (p. 184).

Research by Mann and Holdsworth (2003) revealed how a lack of social support for teleworkers and being unable to talk things through with colleagues could produce several other negative emotions such as feelings of insecurity and lack of confidence in their abilities. In this case, social isolation is considered to be a restricting force in the ability to discuss issues – leading to increased frustration among colleagues.

The extent to which an individual works from home, regulates how much one suffers from social and professional isolation (Kurland & Bailey, 1999). Research by Toscano and Zappalà (2020) on the perception of productivity and telework satisfaction during the COVID-19 pandemic found that social isolation and stress are strongly related, meaning that the social isolation generated by the lack of face-to-face contact with colleagues is positively associated with stress. Furthermore, social isolation and stress were also identified to be negatively related to an individual's perception of productivity.

2.4 PRODUCTIVITY

Productivity is related to the efficiency of employees in an organisation and is an essential concept for all production processes, in which productivity can be distinguished into two types of productivity: individual (labour) productivity and organisational productivity (Jensen & van der Voordt, 2020).

Among manufacturing or production companies, individual labour productivity can be measured easily by dividing output by input, or various other methods proposed by De Been et al. (2017). However, the measurement of individual productivity of office workers, and in particular the productivity of knowledge workers on an individual or organizational level is considered to be difficult, because the output is not easily quantified (De Been et al., 2017). According to Clements-Croome (2000), the productivity of knowledge-workers can be computed using several variables that have a significant effect on productivity, such as employee turnover, absenteeism, and motivation. By combining these variables, the productivity of an employee can be estimated quite accurately (Office of Real Property, 1999). However, as many variables predict a worker's productivity, measuring productivity remains complex (Haynes, 2007). Consequently, it has become common to use perceived productivity (i.e. the individual staff members' perception of output seen in relation to the perception of input) as an indicator of individual productivity (Jensen & van der Voordt, 2020).

Perceived productivity is different from one's actual productivity, as perceived productivity is subjective, thus limiting the validity of the perceived productivity measure (Jensen & van der Voordt, 2020). In 1999, Leaman and Bordass identified that there are both advantages and disadvantages of using perceived productivity scales: self-perceived productivity data is easier to obtain than actual productivity, while perceived productivity may not be the same as actual productivity, as respondents might find that rating their perceived productivity is difficult due to lack of reference. Nevertheless, the measurement of perceived productivity is found to provide useful information on variations and trends in the productivity of knowledge workers (Jensen & van der Voordt, 2020).

The general consensus of telework is that teleworkers tend to be more productive than in traditional offices due to fewer interruptions and distractions, longer working hours, better use of high productivity moments, and increased enjoyment due to flexibility (Tavares, 2017). A large-scale experiment by Bloom et al. (2015) revealed a 13 per cent increase in employee productivity from telework compared to office workers. About 9 per cent of this increase in productivity was from employees working more minutes of their shift period, including fewer breaks and sick days, and about 4 per cent from a higher performance per minute. Nakrošiene et al. (2019) support this finding, discussing how the increase in (self-reported) productivity could be explained by a decreased time in communicating with co-workers, the possibility to take care of family members, and the suitability of the workplace at home.

Kröll and Nüesch (2019) found that flexible work practices (FWP's), such as flexitime, sabbaticals and working from home significantly increase job satisfaction. More anecdotal evidence by Ward (2017) adds that: *"a total of 7 out of the 9 participants interviewed felt that their motivation was increased whilst working from home. Out of the 9 interviewees, 6 participants felt that their performance would be affected negatively if working from home was taken away from them, whereas 3 participants stated their performance would be affected both positively and negatively"* (pp. 40-41).

More recently, academics have also started to investigate how telework intensity impacts work outcomes. It is found that social support and knowledge-intensity play a large role as mediators in whether telework intensity affects productivity: Golden and Gajendran (2019) found that telework intensity has little effect on job performance when social support is high, yet telecommuting has a positive impact on job performance when social support is low. Telework intensity is only significantly related to teleworkers performing a high degree of knowledge work, while no significant effect in those with a low degree of knowledge work (primarily call centre employees). Only a few studies have found that telework is associated with a decrease in productivity. Phelps (1985) notes a drop in productivity during telework, however, this initial decrease in productivity was followed later by an increase. This initial drop in productivity is considered to be primarily due to the initial adjustment to working from home.

Research by Hoornweg et al. (2016) revealed that low telework intensities can be associated with slightly higher levels of individual productivity, while and that higher telework levels (teleworking 8 or more hours per week) report significant lower productivity levels. Therefore, an (inverted) U-shaped relationship between telework intensity and productivity is suggested: low telework intensity is associated with increased productivity through a decreased time communicating with co-workers and fewer distractions. High telework intensity is associated with reduced productivity professional isolation and loss of social interactions (Hoornweg et al., 2016), quite similar to the relationship between telework intensity and teleworker health, presented in Figure 3.

2.5 THE HEALTH-PRODUCTIVITY RELATIONSHIP

The relationship between health and productivity has been revealed in several studies on outcomes of (office) workers. Research by Boles et al. (2004) found that the productivity loss as a result of absenteeism (= absence from work) and presenteeism (= working while sick, resulting in being less productive) among office employees was associated with health risks. Participants with more health-risk factors reported greater productivity loss than those with fewer health risks: for each cumulative health risk, productivity loss as a result of presenteeism was found to range between 1.3% for individuals with zero risks and 25.9% for individuals with eight risks. Moreover, It was also found by Boles et al. (2004) that the percentage of time lost to presenteeism was greater than time lost to absenteeism for each risk factor, thus suggesting that presenteeism results in more productivity loss than absenteeism.

Similarly, research by Mitchell and Bates (2011) revealed productivity loss due to being at high risk for health problems. Higher numbers of health risks and health conditions were associated with lower levels of productivity through higher incidences of sick days and unproductive days due to health problems (i.e. presenteeism). The quality and quantity of work were found to be affected as well when working while sick (Mitchell & Bates, 2011).

2.6 CONCLUSION

This chapter aimed to define the concepts of telework, health and productivity, and to identify how telework affects the health and productivity of teleworkers through literature review of previous research.

Throughout the years, telework has been defined in various ways, often increasing in specificity and complexity. For this study, the following definition of telework has been used: *(1) telework covers a wide range of activities, all of which are performed away from the traditional place of work for a significant portion of work time, (2) telework can be performed on a full-time or part-time basis, (3) telework always involves telecommunications to keep employer and employee in contact with each other.*

The health of an individual can be distinguished between three aspects: physical, mental and social well-being. Physical health problems during telework were found to be related to poor ergonomics of the at-home workplace, while poor mental health was found to be related to stress and depression. Social health problems among teleworkers were found to be related to social and professional isolation. Teleworker health was found to be related to their productivity, in which poor physical, mental and social health were associated with reduced productivity through absenteeism and presenteeism, affecting the quality and quantity of the work that is performed.

Measuring the productivity of knowledge workers was found to be complex, as the input and output of knowledge workers are not easily quantified. Consequently, it has become common to use the individual's perceived productivity as an indicator of individual productivity. Despite not being exactly the same as individual productivity, as perceived productivity is subjective, it was found to be more easily measured and to still provide useful information on the productivity of knowledge workers.

Telework intensity was found to be related to both occupational health and productivity, in which low telework intensity was associated with greater health and increased productivity, while high telework intensity was associated with reduced health and reduced productivity.

CHAPTER 3

PERSONAL & ENVIRONMENTAL CHARACTERISTICS

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CHAPTER 3: PERSONAL & ENVIRONMENTAL CHARACTERISTICS

The previous chapter discussed the various ways in which telework is related to occupational health and productivity and the relationship between health and productivity.

This chapter aims to identify the relationships between teleworker personal characteristics (e.g. gender, age, job role, and education), environmental characteristics (e.g. at-home workplace, household factors and social support) and teleworker health and productivity. First, personal characteristics are discussed in relation to teleworker health and productivity. Following, the relationships between characteristics of the physical and social environment and teleworker health and productivity are discussed.

3.1 PERSONAL CHARACTERISTICS

Previous research has revealed the significance of personal characteristics concerning telework outcomes by identifying that personal characteristics, such as gender and age, are indicative in the way individuals perform while (tele)working (e.g. Ammons & Markham, 2004; Bailey & Kurland, 2002; Mann & Holdsworth, 2003; Steward, 2001; Thorstensson, 2020; Troup & Rose, 2012). Therefore, in this section, the relationships between several personal characteristics and teleworker health and productivity are discussed.

3.1.1 GENDER

Gender differences in telework outcomes are considered to be ambiguous (Nakrošiene et al., 2019): First, it was revealed that women decide to work from home for different reasons than men, where most differences emerge when taking life-cycle, career, and their household into account (Kyzlinková & Svobodová, 2007; Nakrošiene et al., 2019). Older studies found that telework is more valued by women as it helps them to take care of their household and children (Mokhtarian et al., 1998). However, research by Nakrošiene et al. (2019) found that women tend to perceive fewer advantages of telework than men – which appears to contrast with statements by Mokhtarian et al. (1998).

Telework research on the topic of health and productivity reveals several differences between men and women (Ammons & Markham, 2004; Mann & Holdsworth, 2003; Song & Gao, 2018; Troup & Rose, 2012) – however, several of these differences may be explained by the dual responsibilities of teleworking women in the household. It is argued that the clear gender roles and division of household tasks is outdated, as men are becoming more involved in household tasks. However, research by Ammons and Markham (2004) suggested that, at that time, teleworking women still adhered to the traditional gender division of labour within the household. It seems that women are expected to combine other roles when they work from home more than men; women are more likely to fit domestic chores around their telework than men (Mann & Holdsworth, 2003). This finding is further supported by recent research by Czymara et al. (2021), who found that teleworking women are still carrying most of the burden of childcare and household chores during the COVID-19 lockdown.

HEALTH

On the topic of health, Mann and Holdsworth (2003) found that female workers experienced higher levels of physical ill-health than male workers and that teleworkers experienced significantly more emotional and physical ill-health compared to office workers. Steward (2001) suggested a higher instance of stress-related illnesses in teleworking women, compared to teleworking men. Research by Mann and Holdsworth (2003) drew a similar conclusion, revealing a significant difference between the mental health scores for males and females – indicating that females are more likely to experience higher levels of emotional ill-health than males. Henke et al. (2016) support this view, finding that females have an increased risk for depression and stress compared to men, as well as Olson and Primps (1984), revealing that male teleworkers report decreased stress levels working from home.

The dual responsibilities when working from home are identified as causes of stress for women, possibly explaining why female teleworkers experience more mental and physical ill-health than male office workers (Mann & Holdsworth, 2003; Nakrošiene et al., 2019; Song & Gao, 2018). The burden of childcare and household chores is still found to be carried primarily by women, even during the COVID-19 lockdown as found by Czymara et al. (2021), resulting in increased mental ill-health.

Research by Nathania (2015) on the effects of New Ways of Working, of which telework is one of the most important components, found no significant differences between men and women in their experienced social cohesion. No other studies were found discussing gender differences on the topic of social health in the context of telework.

PRODUCTIVITY

Research by Ammons and Markham (2004) revealed that teleworking men found that their work obligations spilt over into home time, while women experienced the opposite problem. Teleworking women found their home tasks and responsibilities spilling over into work time – affecting their overall productivity. However, in a large-scale experiment between teleworkers and office workers performing call centre-related duties in China, no statistical differences across a range of personal characteristics were found, including gender and age (Bloom et al., 2015).

3.1.2 AGE

According to the Statista Research Department (2020), the share of Dutch teleworkers is the highest in the age group 25 to 54 years old, whereas it was least common among the 15-to-24-year-olds. Of the respondents over 65 years old, just over ten per cent were teleworkers. This finding is supported by Henke et al. (2016), stating that employees between 55–64 years old, were less likely to telework than those in younger age groups. Earle (2003) suggested that younger people are more likely to telework than older people, as younger people highly value the freedom and work autonomy that comes with telework. Older workers were found to have fewer advantages of telework, due to a small negative effect of age on respondents' overall satisfaction with telework. (Nakrošiene et al., 2019).

HEALTH

According to the WHO (2018), older age is characterized by the emergence of common conditions including back and neck pain, osteoarthritis, diabetes, depression, dementia, and several others. Therefore, older people are considered to have an increased risk for several musculoskeletal and mental health problems. Research by Henke et al. (2016) found significant variations in the percentage of employees with high health risks by age. Both in-office workers and teleworkers were identified to have an increased risk for obesity the older they become, while younger age groups had an increased risk for depression. A literature review by Rauschenbach et al. (2013) revealed that age might affect several components of the stress process at work (e.g. objective stressors, subjective appraisal, and coping strategies). However, it was suggested that, as these effects are partly conflicting, they might nullify each other in the overall relationship between age and stress.

PRODUCTIVITY

According to Bloom et al. (2015), the age of teleworkers does not affect their productivity. However, the age of teleworkers might be related to the number of years they worked for the same employer or other employers but in similar job roles – which may affect their productivity – which was controlled for in this research. Ng and Feldman (2013) found that job tenure is largely unrelated to core task performance. Job tenure is also only very weakly related to self-ratings of core task performance and ratings by supervisors.

3.1.3 JOB POSITION

Some job positions are more suitable for telework than others. A job position is suitable for telework when some, or most, responsibilities of the job can be performed away from the traditional office without impacting productivity, organizational operations, and team collaboration (Washington State Office of Financial Management, 2018). According to Hobbs and Armstrong (1998), suitable jobs for telework are those that involve a certain degree of autonomy, intrinsic motivation, and long periods of quiet concentration, as well as communication needs that can be met through existing technologies. Bailey and Kurland (2002) add factors similar such as low interdependency between employees, little need for face-to-face interactions, and high job complexity. Examples of responsibilities that are suitable for telework include accounting or auditing, calculating, programming, reading, research, analysis and many more (Washington State Office of Financial Management, 2018).

Naturally, positions that need to be performed in-person, such as health-care, construction or repair, in-person customer service, and in-person IT support, are considered to be unsuitable for telework (Commonwealth of Massachusetts, 2020). Job positions that are considered more suitable for telework, assuming that necessary technologies are in place, are roles such as accountant, data analyst, researcher, architect, journalist, designer, etc. (Commonwealth of Massachusetts, 2020; Washington State Office of Financial Management, 2018). Even though a role may require an employee to be present at the traditional office some of the time, but also requires the employee to set aside time to complete paperwork or write reports. Since some of the responsibilities are not required to be completed at the office, a position may potentially be suitable for a limited amount of telework. Ideally, regardless of the job position, at least one day per week should be scheduled to handle responsibilities and meetings that cannot be dealt with via telephone or email (Boyd, 1997; Hoornweg et al., 2016; Nathania, 2015).

Supervisors and managers monitor the performance of their subordinates, provide direction, and serve as coaches and mentors for their employees. At first glance, management positions may not seem suitable for telework – therefore expressing concerns they cannot effectively perform their responsibilities when teleworking, especially during the COVID-19 pandemic (Parker et al., 2020). However, managers that telework themselves, have suggested otherwise, arguing that if they have responsibilities that can be accomplished away from the presence of subordinates, co-workers, and their supervisor, then they too should be permitted to telecommute (Boyd, 1997). The U.S. Office of Personnel Management (2020) also raises a valid argument: especially managers and supervisors should make it a point to regularly participate in telework, to lead by example, be comfortable with the dynamics of managing in a telework environment, and experience the positive and negative aspects themselves.

So far, little to no differences between teleworking managers and non-managerial employees have been identified on the topic of productivity or health in recent research. Research on self-rated productivity and employee well-being in activity-based offices by Haapakangas et al. (2018) did find such a relationship during their initial analysis - showing that managers report higher ratings for productivity and well-being than employees in non-managerial positions. However, regression analysis found basic demographic covariates such as age, gender and managerial position explained together only 2% of the variance in productivity and well-being.

3.1.4 EDUCATION

Demographic data from various sources provide insights into the population of teleworkers, which mostly consist of either mid-level or highly educated professionals (Bailey & Kurland, 2002; Cooper & Kurland, 2002; Haddon & Brynin, 2005; Nathania, 2015; Sardeshmukh et al., 2012). These findings are supported by López-Igual and Rodríguez-Modroño (2020), who found that an individual's level of

education strongly determines the likelihood of them opting for telework, in which high educational attainment was associated with increased likelihood of performing telework.

The large proportion of highly-educated people in the teleworking population may be explained by the nature of their work being suitable for telework, while jobs that require low levels of education are not suitable for telework, due to characteristics described in Section 3.1.3: "*Homeworkers are more highly educated than the labour force in general. Non-ICT based homeworking does not appear to be undertaken by people with low levels of education and who might, as a consequence, be expected to be doing poorly paid and routine work"* (Haddon & Brynin, 2005, p. 9).

According to Koppes et al. (2010), teleworking is relatively prominent in the financial services branch, where especially higher educated employees work from home. As telework is mostly dominated by managerial, professional and associate professional/technical workers (Haddon & Brynin, 2005), it raises the hypothesis that someone's job position may be related to their level of education, and/or vice versa. However, due to the COVID-19 pandemic, there is no effect of education on whether one teleworks in this study.

It is also found that education is related to health through socio-economic factors. Zajacova and Lawrence (2018) claim that, in general, adults with higher educational attainment live healthier and longer compared to their less-educated peers, as "education leads to better, more stable jobs that pay higher income and allow families to accumulate wealth that can be used to improve health" (p. 227). Research by Ng and Feldman (2009) on office workers found that education level is positively related to job-related productivity. This finding may suggest that highly-educated employees are more prepared for autonomous work and low interdependency – which are important characteristics of successful teleworkers (Bailey & Kurland, 2002; Hobbs & Armstrong, 1998). Ng and Feldman (2009) also found this education-performance relationship to be stronger for non-managers than for managers, and stronger for men than for women. This means that the effect of education level on performance is stronger in non-management employees than in managers and that the effect of education level on performance is stronger in men than in women.

3.2 ENVIRONMENTAL CHARACTERISTICS

Several studies discussed the physical workplace as one of the most important resources that influence telework outcomes, such as health and productivity (Ammons & Markham, 2004; Nakrošiene et al., 2019; Tavares, 2017; Thorstensson, 2020). Additionally, as can be concluded from Section 2.2.2.1, the work-life balance mediates the effects of telework on productivity and health. As the work-life balance of home-based teleworkers is heavily dependent on their direct social environment (Githinji & Wekesa, 2017), the social environment of the teleworkers is considered to be another important determinant of the effect of telework on outcomes. Therefore, in this research, an emphasis is placed on the physical and social environment of the teleworker.

3.2.1 CHARACTERISTICS OF THE PHYSICAL ENVIRONMENT

When choosing their at-home workplace, most teleworkers choose to take the smallest or least-contested space available in the house, over inconveniencing family members (Ammons & Markham, 2004; Steward, 2001). Telework allows the design of individually selected workspaces in the home environment – suggesting that suitable furniture can be found in the at-home workplace. However, research by Steward (2001) revealed poor ergonomics in a large portion of teleworkers' at-home workplaces: 72 per cent of men and 77 per cent of women worked in dual-purpose living rooms or bedrooms, while only little over half of the respondents said they had purpose-built workplaces. Research by Ammons and Markham (2004) and Olson and Primps (1984) concur with these findings by Steward (2001), revealing that many teleworkers are considered to have an unsuitable workplace at

home. This suggests that there is a lack of awareness regarding the importance of a suitable and well-designed at-home workplace.

More recently, research conducted by Leesman (2020) asked employees of various organisations, industries and regions what type of workplace they have available to use when working from home; a dedicated work-room or office, a dedicated work area (which is not enclosed), or a non-work specific home location (such as a dining table). This study found that employees who used dedicated offices reported the best home-working experience, while those working in areas not intended for work reported the worst experience working from home: "*Having a dedicated work area – even if it is not enclosed – may still provide a better home working experience than working from a kitchen table or sofa*" (Leesman, 2020, p. 10).

In measuring the effects of the physical work environment on health, findings regarding physical well-being are predominant. Only one study found that none of the respondents attributed any illness or health risk to their at-home workspace even though a large portion of respondents claimed to have no purpose-built workplace (Steward, 2001). Poorly designed and situated spaces are considered to have a negative effect on physical health (Ammons & Markham, 2004; Nakrošiene et al., 2019; Tavares, 2017). Theories originating from workplace-research, reveal the effects of poorly designed workplaces on employee's physical health through ergonomics: e.g. an unsuitable chair or desk can cause poor posture, which could prove very harmful for one's health in the long run (Beauregard et al., 2019; Crawford et al., 2011; Tavares, 2017). In this study, it is considered that purpose-built workplaces are more likely to contain suitable office furniture, compared to regular common areas at home.

An extensive literature review by Colenberg et al. (2021) identified that other aspects of the physical environment are also important for the physical and mental health of teleworkers: shared rooms (or open-plan offices) are found to be associated with higher background noise, which is negatively related to health (e.g. Colenberg et al., 2020, 2021; Van Der Meulen et al., 2012). Also, strong relationships have been found regarding (sufficient) daylight, indoor temperature, ventilation and greenery (Colenberg et al., 2021; Gajendran & Harrison, 2007; Standen et al., 1999). Telework allows individuals to have control over breaks, layout, lighting, ventilation and other ambient elements that can contribute to increased feelings of autonomy, leading to increased satisfaction (Colenberg et al., 2021; Elsbach, 2003).

Research by Nakrošiene et al. (2019) emphasizes that a suitable workplace (including good ergonomics, and work conditions such as noise and temperature) is of utmost importance for the success of telework. The findings of this study revealed that the suitability of the workplace strengthened all measured telework outcomes in the study, such as overall satisfaction with telework, perceived advantages of telework, career opportunities, and increased self-reported productivity (Nakrošiene et al., 2019). Working in common areas is revealed to make work activities too permeable to interruptions, and makes it difficult to set a clear boundary between work-time and personal-time (Ammons & Markham, 2004). Consequently, doing work in a separate room with a door allows teleworkers to work more productively, as they can focus on their work and finish their tasks without being interrupted (Thorstensson, 2020).

3.2.2 CHARACTERISTICS OF THE SOCIAL ENVIRONMENT

In this study, the social environment of teleworkers is categorized into two domains: the social environment of the home/family, and the social environment of work.

FAMILY DOMAIN

In normal circumstances, non-work-related factors such as family orientation and the amount of household distractions are most predictive of an individual's choice to work remotely (Bailey & Kurland,

2002; Huws et al., 1990). Telework provides individuals with the ability to combine the dual role of childcare with teleworking, as well as other tasks (Grant et al., 2013). Therefore, for individuals who telework as a means to balance family with work, telework is most likely to be abandoned when the youngest child enters school (Bailey & Kurland, 2002).

Several of the abovementioned factors negatively influence telework outcomes (Thorstensson, 2020), and are mainly concerned with spending time on non-work related issues, such as demands from family members and the presence of young children (Mann & Holdsworth, 2003; Nakrošiene et al., 2019). Even though teleworkers with children rated the family benefits of teleworking to be higher, compared to those with no children at home (Mokhtarian et al., 1998), research by Nakrošiene et al. (2019) revealed that the number of children in the household negatively influences one's satisfaction with telework. According to Golden et al. (2006), one's household size negatively affects the work-life balance of teleworkers. This means that when the household size of a teleworker is large, there is an increased probability of work-family conflicts (such as the intrusion of family members during work) – therefore resulting in reduced satisfaction with telework and reduced productivity.

Within the family domain, the partner of the teleworker plays a role in telework outcomes. So far, little research has been conducted on whether partners affect the productivity of teleworkers. Research by Vittersø et al. (2003) found that when someone teleworks often, their partners' general satisfaction with life, becomes somewhat reduced – most likely due to the affected work-family boundary. Due to the current circumstances related to the COVID-19 pandemic, it is very reasonable to assume that the partners of teleworkers are home more often than in the study by Vittersø et al. (2003), and might telework as well.

WORK DOMAIN

Telework affects both the family and work domain of their social environment. Teleworkers are faced with lower visibility and support from their supervisors (Cooper & Kurland, 2002). Yakovleva et al. (2010) emphasized that trust is a very important aspect of full-time teleworking, as interactions with supervisors are mainly virtual.

According to Thorstensson (2020), a lack of trust and support between the organisation and the employee has a negative effect on productivity. This social support (the extent to which a job provides opportunities for obtaining advice and assistance from supervisors and co-workers) moderates the relationship between the extent of telework and job performance (Golden & Gajendran, 2019). Additionally, research by Nakrošiene et al. (2019) found supervisor trust to be an important determinant of an individual's overall satisfaction with telework. Moreover, the extent of telework also appears to affect job performance, as found by Golden and Gajendran (2019). However, the extent of telework only influences job performance beneficial for individuals with little social support and does not affect the job performance for individuals with high social support.

There are many factors influencing productivity that are distance-related. Thorstensson (2020) claims that some of the most important distance-related factors affecting productivity are concerned with the absence of a team environment, and having difficulty accessing people for cooperation. Teleworkers must be able to work independently from others, as a dependent worker would be unable to complete a task on his own without constant input or support from another co-worker or supervisor, which could put a strain on that worker and the project. Golden and Gajendran (2019) identified that full-time teleworkers, who worked in jobs involving little interdependence (dependency on teamwork or other workers), had higher job performance than those working in highly interdependent jobs. Thorstensson (2020) supports this finding by claiming that interdependency between employees working from home and in-office employees has a negative influence on productivity.

3.3 CONCLUSION

This chapter aimed to identify the relationships between teleworker personal characteristics, environmental characteristics and teleworker health and productivity through literature review of previous research.

Previous research identified several relationships between the personal characteristics of teleworkers and their health and productivity. In normal circumstances, telework is most likely to be performed by young, highly educated individuals that are able to perform their work tasks autonomously. Despite being more popular among family-oriented individuals, it is found that telework is not ideal for individuals with children at home - as the presence of children negatively influences telework satisfaction and productivity.

It was found that differences between the health and productivity of teleworking men and women are related to the division of household tasks and the dual responsibilities that come with telework, in which women were still carrying most of the burden of childcare and household chores during the COVID-19 lockdown. Age was found to be negatively related to physical health, as older age was found to be associated with poor musculoskeletal health, and the emergence of other health conditions such as diabetes, depression, dementia, and several others. Younger age was found to be related to an increased risk of depression. The job role was found to be related to employee well-being and productivity, in which managers reported slightly higher ratings for productivity and well-being than employees in non-managerial positions. Education is found to be associated with health through socio-economic factors, as adults with higher educational attainment live healthier and longer lives compared to their less-educated peers. Regarding productivity, previous research suggested a positive relationship between educational attainment and productivity through lower interdependency and higher autonomy, which are important factors for successful telework, among those who have higher educational attainment.

Previous research revealed that the suitability of the physical workplace was considered one of the most important resources for successful telework, in which various aspects of the physical environment (e.g. type of space, lighting, noise, ergonomics) were found to be related to teleworker health and productivity. The social environment was also associated with teleworker health and productivity, as family members, roommates and the presence of young children were found to negatively influence teleworker productivity and mental wellbeing through distractions and dual responsibilities. Also, a lack of trust and support between the organisation and the employee was found to be negatively related to teleworker productivity and mental health.

CHAPTER 4

METHODOLOGY

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CHAPTER 4: METHODOLOGY

The previous chapter identified the relationships between teleworker personal characteristics, environmental characteristics and teleworker health and productivity. This chapter aims to describe the methodology of the current study in preparation for the various quantitative analyses that are performed.

First, the data collection and general methodology of the research are discussed, after which the research design is elaborated upon. Following, the operationalization process of the dataset is discussed. Furthermore, the reliability and validity of the research's findings are discussed. To conclude, the proposed statistical analyses methods that are used in the current study explained in detail.

4.1 DATA COLLECTION

To correctly analyse the effects of personal and environmental characteristics on the health and perceived productivity of teleworkers during the COVID-19 pandemic, and how their health is related to their perceived productivity, a large sample is required. Baarda et al. (2012) discussed several methods to collect quantitative data such as (structured) interviews and questionnaires. In this study, an existing dataset was used, of which the data is collected through large scale (weekly) questionnaires. A questionnaire is a research instrument consisting of several questions to gather information from a large group of respondents. Questionnaires provide a quick and efficient way of obtaining large amounts of information, especially from a large sample of people – as the researcher would not need to be present when the questionnaires are completed (Baarda et al., 2012). Hence, data collection through questionnaires is considered the most suitable method for this research.

As briefly mentioned before, an existing dataset was used for the current research. This data was provided by the "We Work from Home" (WWH) research project, a collaboration between the Centre for People and Buildings, Aestate/Ontrafelexperts, Eindhoven University of Technology, and the Delft University of Technology. WWH collected data during nine consecutive weeks among Dutch office workers of different public organisations, such as several Dutch ministries, the Dutch Tax Authority, and other public organisations which are presented in Table 1. Through short questionnaires, participants were asked to answer questions regarding their telework experience, such as their motivation, health, and productivity every week. These questionnaires were largely based on scientific literature regarding telework. Data was collected by WWH between the 27th of April and the 20th of November of 2020, dependent on the cohort in which the respondent is assigned. Cohorts were assigned dependent on the public organisation for which the respondent worked, which are also presented in Table 1.

For this study, data from the questionnaires from week 3 and week 7 were used, as these weeks focus on teleworker health and productivity and thus were deemed most appropriate for answering the research questions. Using this existing data provided several advantages (Baarda et al., 2012): time, effort and money were saved which was otherwise spent on the data collection stages of the research. The biggest disadvantage of performing secondary data analysis was that the existing data may not include all of the factors and findings from the literature review. In the case of the current study, the existing dataset does not include factors that were found to affect telework health and productivity according to previous research, such as job motivation, telework intensity, type of contract (full-time, part-time, or # of hours) and several other factors discussed in previous telework research (e.g. Hoornweg et al., 2016; Kröll & Nüesch, 2019; Manukjan, 2012; Thorstensson, 2020).

Nevertheless, the dataset is deemed to be appropriate for this research through the large sample size, measurements of perceived productivity and health, as well as several personal characteristics and environmental characteristics.

Table 1 Organisations in the dataset

Cohort 1	Cohort 2	Cohort 3
Dutch Ministry of Finance	Dutch Tax Authority *(part II of II)*	Dutch Ministry of Education, Culture and Science
Dutch Tax Authority *(part I of II)*	Dutch Ministry of General Affairs	Dutch Ministry of Health, Welfare and Sport
DCMR	Dutch Ministry of Foreign Affairs	Administrative High Court
Dutch National Police Force	Dutch Ministry of Infrastructure and Water Management	Dutch Ministry of Social Affairs and Employment
Kadaster	Dutch Ministry of Justice and Security, including:	UWV Employee Insurance Agency
De Nederlandsche Bank	- Dutch Forensic Institute - Dutch Public Prosecution Office	Dutch Ministry of Economic Affairs and Climate Policy
Dutch Ministry of the Interior and Kingdom Relations		Dutch Ministry of Agriculture, Nature and Food Quality
Province of Zuid-Holland		
Respondents from cohort 1 filled in 'week 3' between the 27th of April and the 14th of June 2020. 'week 7' was filled in between the 8th of June and the 12th of July 2020	*Respondents from cohort 2 filled in 'week 3' between the 20th of July and the 9th of August 2020. 'week 7' was filled in between the 17th of August and the 6th of September 2020*	*Respondents from cohort 3 filled in 'week 3' between the 15th of September and the 23rd of October 2020. 'week 7' was filled in between the 13th of October and the 20th of November 2020.*

4.2 COMPARING QUESTIONNAIRES

As mentioned in the previous paragraph, data from the questionnaires from week 3 and week 7 were used, as these weeks focus on teleworker health and productivity and thus were most appropriate for answering the research questions. These two questionnaires had several similarities in some aspects, but they were also very different from each other in other aspects: week 7's questionnaire was of a descriptive and explanatory nature, while week 3's questionnaire was more suitable for quantitative research by being largely based on findings from previous research.

Because week 3 was more based on scientific literature, this questionnaire was selected to perform most of the quantitative analyses. In the next chapter, the differences in the samples are discussed through descriptive and bivariate analyses, in order to determine if the findings from analysis on week 3 may also apply for week 7's sample.

4.3 RESEARCH DESIGN

The conceptual model (**Figure 5**) presents the factors which are be related to teleworker health and productivity according to the findings from the literature review. Only those factors referenced in the literature review, and that were also measured in week 3's questionnaire, were included in this model, as only those factors can be measured in the quantitative analyses.

Following the conceptual model, it is hypothesized that personal characteristics (i.e. gender and age) and environmental characteristics (i.e. the physical home environment) affect the perceived physical, mental and social health of teleworkers. In turn, it is hypothesized that the productivity of teleworkers is affected by health, but also directly and indirectly by personal and environmental characteristics.

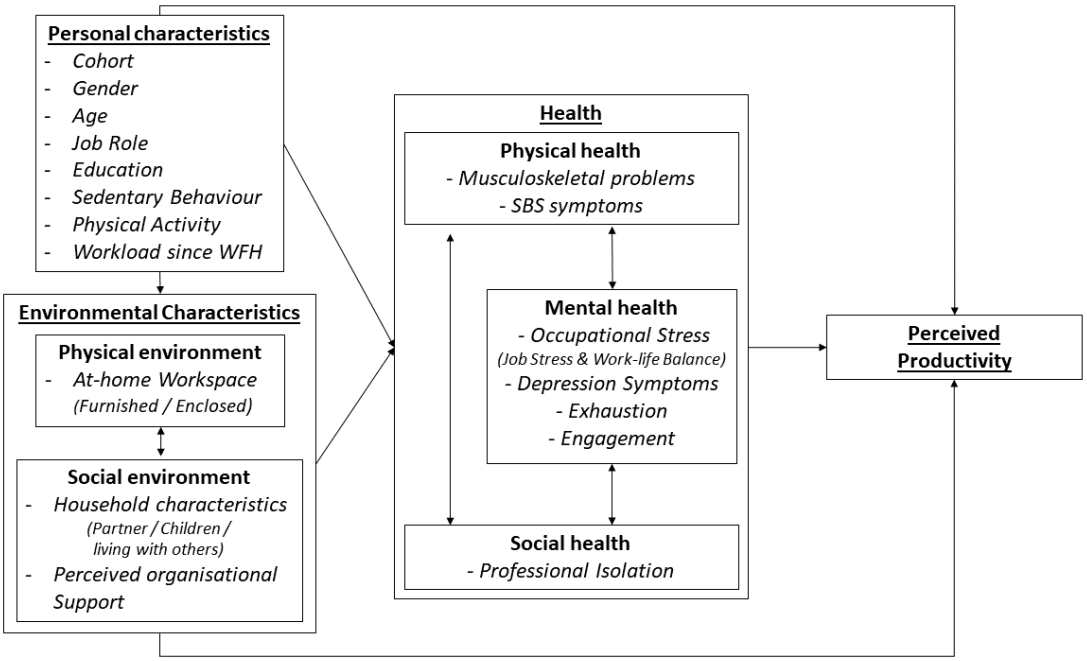

Figure 5 Conceptual Model

The independent variables (or predictor variables) were divided into personal and environmental characteristics. Personal characteristics included the gender, age, job position and level of education of the teleworker. Tavares (2017) discussed that personal characteristics are very important in determining the way people deal with the obstacles of teleworking and perform their tasks, especially without damaging their health. The significance of personal characteristics and their effects on telework outcomes (such as health and productivity) was supported by a literature review (Ammons & Markham, 2004; Bailey & Kurland, 2002; Mann & Holdsworth, 2003; Steward, 2001; Thorstensson, 2020; Troup & Rose, 2012). For example, Henke et al. (2016) found that teleworkers were identified to have an increased risk for obesity the older they become, while younger age groups had an increased risk for depression.

In addition to personal characteristics, it was found that the environment of teleworkers was related to their health and productivity. Inadequacy of the physical at-home workspace was found to be harmful to one's health in the long run (Ammons & Markham, 2004; Nakrošiene et al., 2019; Tavares, 2017). Furthermore, the social environment at home was found to be related to telework outcomes, as teleworkers are also concerned with spending time on non-work related issues, such as demands from family members and the presence of young children (Mann & Holdsworth, 2003; Nakrošiene et al., 2019). The social work environment of teleworkers was important in maintaining good physical, mental and social health. Teleworkers are faced with lower visibility and support from their supervisors (Cooper & Kurland, 2002). A lack of social support and trust from the organisation was found to be associated with reduced productivity, directly and indirectly through satisfaction with telework (Nakrošiene et al., 2019; Thorstensson, 2020).

These independent variables were found in the literature to be related to teleworker health and productivity, which are the dependent variables in this model. Health acts as both a dependent and independent variable, as the health of teleworkers is related to their perceived productivity (Tavares, 2017). Physical health aspects that were found to be related to telework include musculoskeletal problems (Crossan & Burton, 1993; Skov et al., 1996; Standen et al., 1999; Tavares, 2017), as well as problems regarding Sick Building Syndrome (Eurofound, 2020).

Oakman et al. (2020) found that telework could have negative or positive impacts on mental health. Previous research reported various mental health-related outcomes that were found to be related to telework. However, due to the approach of this thesis (using an existing dataset), only some of these aspects were measured, being: stress, (symptoms of) depression, and fatigue. Being unable to meet with colleagues physically and being far from the traditional office, in combination with long, continuous working hours as a result of telework was found to induce feelings of loneliness and isolation (Grant et al., 2013; Kurland & Bailey, 1999; Mann & Holdsworth, 2003; Skov et al., 1996).

To conclude, WWH measured employee productivity as a perceived productivity measurement as it is easier to measure through questionnaires than objective productivity. Leaman & Bordass (1999) found that perceived productivity scales may not be the same as actual productivity due to a lack of reference. Nevertheless, the use of perceived productivity was found to be commonly used as an indicator of individual productivity (Jensen & van der Voordt, 2020), and thus was determined to be appropriate for the current research.

4.4 OPERATIONALIZATION

Operationalization concerns how factors are measured and used for quantitative analyses. The factors described in the previous paragraph all require consistent measurement to prevent the inaccuracy of the results of these analyses. This section describes how each variable was defined and measured. As briefly mentioned, it was found that a large number of variables in week 3's questionnaire were based on scientific literature and established scales of measuring health aspects such as professional isolation.

Data on personal characteristics and environmental characteristics were simply gathered through questions such as 'what is your gender?', 'what is your age?', and 'indicate your most commonly used workplace at home', except for perceived organisational support. Furthermore, several health aspects related to musculoskeletal problems, symptoms of SBS and depression were identified through questions such as 'have you developed [health problem] in the past 4 weeks?'.

For the measurement of more complicated concepts, such as professional isolation and job stress, established scales were used in the questionnaires. For example, to measure 'job stress' (part of) the new job stress scale by Shukla and Srivastava (2016) was used. This scale measures job stress through nine statements which can (in theory) be merged into one single variable: 'job stress' by computing the mean of each respondents' responses regarding that particular construct. However, before reducing the six questions which were used in the questionnaire into one variable, they needed to be tested on their validity (the extent to which an instrument measures what it is intended to measure) and reliability (the ability of an instrument to measure consistently) (Tavakol & Dennick, 2011). As this study uses established scales (to an extent) it is expected that measurements meet the requirements of validity and reliability (for an overview, see Table 13).

To measure the internal consistency of the measurement in the questionnaire, Cronbach's Alpha was used. Internal consistency describes the extent to which all the items in a test measure the same concept or construct (such as job stress) as a number between 0 and 1 (Tavakol & Dennick, 2011). Additionally, it estimated the amount of measurement error in the test. "*If the items in a test are correlated to each other, the value of alpha is increased*" (Tavakol & Dennick, 2011, p. 53), thus closer to 1, while acceptable values of alpha range from 0.70 to 0.95. However, an alpha that is too high may suggest that some items are redundant, therefore a maximum alpha value of 0.90 is recommended.

According to Pallant (2001), Cronbach alpha values are quite sensitive to the number of items in the scale. Therefore, it is common to find low Cronbach alpha-values, such as 0.5, when there are fewer than ten items. Briggs & Cheek (1986) report that, in these cases, it is deemed more appropriate to

report the mean inter-item correlation for the items in the proposed scale, of which the optimal range for inter-item correlation is between 0.2 to 0.4. Therefore, when Cronbach alpha-values were found to be too low, the mean inter-item correlation is also reported.

4.4.1 ENVIRONMENTAL CHARACTERISTICS

AT-HOME WORKSPACE

In the current research, respondents were asked to report the at-home workspace they used most often. When selecting this workspace, two aspects were most important: whether the room is furnished for their work with office furniture (e.g. an adjustable desk chair, laptop stand, etc.) or not, and whether the workspace is in an enclosed room or a room shared with others. Furnished rooms were expected to affect physical health positively, and an enclosed room was expected to affect concentration and productivity positively. However, working in an enclosed room was also expected to negatively impact social health.

To analyse the effects independently, the at-home workspaces were recoded following the recoding scheme in Table 2, into two dummy variables: *1) furnished workspace, and 2) enclosed workspace.*

Table 2 Recoding scheme furnished and enclosed workspace

Type	Furnished	Enclosed
Furnished and enclosed workspace	1	1
Non-enclosed furnished workspace	1	0
Enclosed non-furnished workspace	0	1
Non-enclosed non-furnished workspace	0	0

HOUSEHOLD TYPE

As stated in Section 3.2.2, demands from family members and the presence of young children are concerned with spending time on non-work related issues, and thus a negative impact on telework outcomes (Mann & Holdsworth, 2003; Nakrošiene et al., 2019). Additionally, one's household size is found to negatively impact the work-life balance of teleworkers (Golden et al., 2006).

In the current research, respondents were asked to state their household composition, or household type – in which the following options were available: *1) Single-person household; 2) Single-parent household; 3) Couple without children; 4) Couple with children; 5) Living with roommates, and 6) Living with parents.* To independently analyse the effects of living with others, having children and/or having a partner, the household type variable was recoded following the recoding scheme in Table 3.

Table 3 Coding scheme of Household factors

Household type	Children	Partner	Living with others
Single-person household	0	0	0
Single-parent household	1	0	1
Couple without children	0	1	1
Couple with children	1	1	1
Living with roommates	0	0	1
Living with parents	0	0	1

PERCEIVED ORGANISATIONAL SUPPORT

A lack of trust and support between the organisation and the teleworker has a direct effect on productivity (Golden & Gajendran, 2019; Thorstensson, 2020) and an indirect negative effect on

productivity through satisfaction with telework (Nakrošiene et al., 2019). In the current study, perceived organizational support was measured on both the organisational level and the manager level for which no established measurement scale was used. Respondents were asked to report the extent to which they agreed with the statements on a five-point scale, ranging from never (1) to always (5).

Perceived organisational support was measured through the following four statements: *1) The organisation pays enough attention to my work-life balance, 2) The organisation pays enough attention to health and vitality, 3) My supervisor supports me in balancing my work-life balance, and 4) My supervisor supports me in the areas of health and vitality.*

For both surveys, a high and acceptable Cronbach's Alpha was found, of which a more detailed process of dimension reduction can be found in Appendix III and IV.

Table 4 Dimension reduction: Perceived organisational support

Survey	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Week 3	.784	.786	4
Week 7	.811	.815	4

4.4.2 HEALTH

4.4.2.1 MUSCULOSKELETAL PROBLEMS

In the WWH datasets, several types of musculoskeletal problems were identified. Musculoskeletal problems, such as *'pain in the neck and/or shoulders', 'pain in hand and/or arms', 'pain in the lower back',* as well as *'pain in legs and/or joints (e.g. knees or hips)'*. These variables were tested on whether they could be combined into a variable that describes the number of musculoskeletal problems one suffers from, ranging from 0 to 4 problems.

Table 5 Dimension reduction: Musculoskeletal problems

Survey	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items	Mean inter-item correlation
Week 3	.506	.507	4	0.204
Week 7	.196	.201	4	0.058

Initially, this case did not meet the requirements for dimension reduction based on Cronbach's alpha. However, the requirement was (barely) met based on the mean inter-item correlation of 0.204 for week 3 data. Week 7 data on musculoskeletal problems did not meet the requirements for dimension reduction based on Cronbach's alpha values. It is expected that this is the case due to 'anchoring', a concept which is explained in Section 5.4.

4.4.2.2 SBS SYMPTOMS

In the WWHT datasets, two types of SBS symptoms were identified*: 'irritation of the eyes, nose and/or throat'* and *'(frequent) headaches'*. These variables were tested on whether they could be combined into a variable that describes the number of SBS symptoms one suffers from, ranging from 0 to 2 symptoms.

Table 6 Dimension reduction: Symptoms of Sick Building Syndrome

Survey	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items	Mean inter-item correlation
Week 3	.372	.374	2	.230
Week 7	.273	.275	2	.159

Both datasets did not meet the requirements for dimension reduction based on Cronbach's alpha values. However, the requirement was met based on the mean inter-item correlation of 0.230 for week 3 data. Both requirements were not met for week 7 data, similar to musculoskeletal problems, it is expected that this is the case due to 'anchoring'.

4.4.2.3 OCCUPATIONAL STRESS

Stress is the *"perception of threat, with resulting anxiety discomfort, emotional tension, and difficulty in adjustment"* (Fink, 2009), where high levels of job stress are related to increased rates of heart attack, hypertension, obesity, addiction, anxiety, depression and other disorders. In 2016, Shukla and Srivastava developed a new version of a 'job stress scale', which measures an extended set of psychosocial stressors by adding new scales to the current version of the job stress scale. This new job stress scale included various aspects that attribute to occupational stress, such as job stress, job expectation conflict, co-worker support, and work-life balance (Shukla & Srivastava, 2016). In this study a part of the new job stress scale by Shukla and Srivastava (2016) was used, being 'job stress' and 'work-life balance'.

JOB STRESS

As job stress is an important predictor of telework outcomes, it was important to define a job-stress value/score for each respondent. In the WWH surveys, respondents were asked to state what they agreed with several statements. Before receiving statements on their job stress level, the respondent was asked to report whether their workload has increased, decreased or remained similar since they started working from home. Dependent on their answer, respondents were assigned five or six statements:

- Those who reported similar or higher workloads were assigned six statements. These items of job stress for respondents with higher, or similar workloads were adopted by Shukla and Srivastava (2016) from the short version questionnaire developed by Jamal and Baba (1992). Of the nine items in the scale by Shukla and Srivastava (2016), only six items were selected for the measurement of job stress in this study, specifically: *1) I have a lot of work and fear that very little time to do it, 2) I feel so burdened that even a day without work seems bad, 3) I feel that I never take a leave, 4) My job makes me nervous, 5) Many a time, my job becomes a big burden, and 6) I feel bad when I take a leave.* Five-point rating scales were used (1 = strongly disagree, 5 = strongly agree).
- Respondents who reported a lower workload since they started telework were assigned five statements. For these respondents' statements, no established scale was used, instead, the 5 items were created which are loosely based on the items by Shukla and Srivastava (2016): 1) *I look up to the things I still have to do now that I have less work to do, 2) I have so little work that I don't feel useful, 3) It makes me nervous that I have less work now, 4) The fact that I have less work feels like a big burden, and 5) It makes me angry that I can do less for work.*

Alpha values were calculated using the questions above, dependent on the workload the respondent reported. As Cronbach's alpha values were found to be acceptable, the mean job stress of each respondent was computed.

Table 7 Dimension reduction: Job stress

Survey	Workload	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Week 3	Increased Workload	.873	.874	6
	Similar Workload	.874	.876	6
	Decreased Workload	.821	.821	5
Week 7	Increased Workload	.872	.873	6
	Similar Workload	.870	.873	6
	Decreased Workload	.825	.825	5

WORK-LIFE BALANCE

In the new job stress scale by Shukla and Srivastava (2016), four items were used to measure the work-life balance of teleworkers. These four work-life balance items were adopted from the work-life balance scale developed by Brough et al. (2009), which was used to assess employees' experience in balancing between their work and non-work life.

In this study, only two of the four items were used: 1) *I am able to balance between time at work and time at other activities, 2) I feel that the job and other activities are currently balanced*. Five-point rating scales were used (1 = strongly disagree, 5 = strongly agree). For both surveys, a high and acceptable Cronbach's Alpha was found, of which a more detailed process of dimension reduction can be found in Appendix III and Appendix IV.

Table 8 Dimension reduction: Work-life balance

Survey	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Week 3	.811	.811	2
Week 7	.817	.817	2

4.4.2.4 DEPRESSION SYMPTOMS

In the WWH datasets, four types of depression symptoms were identified: *1) difficulty concentrating on tasks, 2) little interest or enjoyment in doing things, 3) feeling gloomy, depressed or hopeless, and 4) poor appetite or overeating.* These four types are part of the nine-item Patient Health Questionnaire (PHQ-9). These variables are tested on whether they can be combined into a variable that describes the number of depression symptoms one suffers from, ranging from 0 to 4 symptoms.

Both datasets did not meet the requirements for dimension reduction based on Cronbach's alpha values. However, the requirement was met based on the mean inter-item correlation of 0.230 for week 3 data, and 0.261 for week 7 data.

Table 9 Dimension reduction: Depressive symptoms

Survey	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items	Mean inter-item correlation

Week 3	.572	.582	4	.230
Week 7	.586	.585	4	.261

4.4.2.5 EXHAUSTION

For the measurement of exhaustion or fatigue in this study, no established measurement scale was used. Instead, four items were created to measure exhaustion or fatigue of which the first two were reverse-scored: *1) I can leave work at the end of the homework day, 2) I can relax well after a day's work at home, 3) I feel mentally tired when I start work in the morning and 4) I feel mentally exhausted by my work at the end of the day.* As these questions were found to be related to emotional and mental energy, it is found that exhaustion was measured.

A five-point scale ranging from strongly disagree (1) to strongly agree (5) was used. For both surveys, a high and acceptable Cronbach's Alpha was found:

Table 10 Dimension reduction: Exhaustion

Survey	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Week 3	.792	.793	4
Week 7	.810	.811	4

ENGAGEMENT

In this study, engagement was measured through the 'Utrecht work engagement scale' (UWES) by Schaufeli and Bakker (2004a). The UWES has been developed as a self-report questionnaire including the three constituting aspects of work engagement: vigour, dedication, and absorption. To not tire respondents with 17 similar questions, but to still accurately measure engagement, a selection of six was made for this study - including questions from each of the three aspects of work engagement according to Schaufeli and Bakker (2004a). The six items are as follows: *1) I am enthusiastic about my work, 2) My work inspires me, 3) When I get up in the morning, I feel like going to work, 4) When I am working very intensively, I feel happy, 5) I am proud of the work I do, and 6) I am immersed by my work.* A five-point scale ranging from strongly disagree(1) to strongly agree (5) was used.

For both surveys, a high and acceptable Cronbach's Alpha was found, of which a more detailed process of dimension reduction can be found in Appendix III and IV.

Table 11 Dimension reduction: Engagement

Survey	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Week 3	.873	.873	6
Week 7	.877	.877	6

PROFESSIONAL ISOLATION

Studies have identified that being unable to meet with colleagues physically and being far from the traditional office, in combination with long, continuous working hours can induce feelings of loneliness

and isolation (Bailey & Kurland, 2002; Grant et al., 2013; Mann & Holdsworth, 2003; Skov et al., 1996). For measuring the degree of social isolation in teleworkers, seven items of the Professional Isolation scale, developed by Golden et al. (2008), were used. This scale was found to be highly correlated with the UCLA Loneliness Scale (version 3) which is a well-established scale in academic research.

The Professional Isolation scale is composed of seven items: *1) I feel left out on activities and meetings that could enhance my career, 2) I miss out on opportunities to be mentored, 3) I feel out of the loop, 4) I miss face-to-face contact with co-workers, 5) I feel isolated, 6) I miss the emotional support of co-workers, and 7) I miss informal interaction with others.* These seven items were also used in questionnaire week 3, but not in week 7. Instead, self-formulated questions regarding (professional) social isolation were used. Only the Cronbach's Alpha for week 3 is presented, as week 7's questionnaire did not include the same questions.

Table 12 Dimension reduction: Professional Isolation

Survey	Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
Week 3	.848	.847	7

4.5 RELIABILITY AND VALIDITY

Reliability refers to the consistency of a measure, thus ensuring that the data is as little as possible dependent on coincidence and random errors (Baarda et al., 2012). Internal consistency is associated with the consistency of people's responses across the items on a multiple-item measure. In general, all the items on such measures are supposed to reflect the same underlying construct, so people's scores on those items should be correlated with each other (Price et al., 2015).

In the current research, internal validity and reliability are high among various health aspects as established scales were used for the measurement of that specific underlying construct, such as Golden et al.'s Professional Isolation scale (2008) and Schaufeli and Bakker's Utrecht Work Engagement Scale (2004) (see Table 13). Regarding other constructs such as exhaustion and perceived organisational support, underlying items were not based on established scales, thus limiting the internal consistency of the construct that is proposed to be measured. Consequently, Cronbach Alpha analyses were conducted and presented in the previous section. Results from these analyses revealed acceptable internal validity among various constructs such as musculoskeletal health and depression as seen in Table 13.

Table 13 Instrument reliability per scale

Scale label	Established scale	# of items	Cronbach's alpha	Mean inter-item correlation	Mean	Variance	SD
Perceived Organisational Support	-	4	0.784		3.25	0.597	0.773
Musculoskeletal Problems	-	4	0.507	0.204	0.98	1.114	1.055
SBS Symptoms	-	2	0.372	0.230	0.35	0.356	0.597
Job Stress	Parts of 'new job stress scale' by Shukla & Srivastava (2016)	6	0.868		2.47	0.619	0.787
Work-life balance	Parts of 'new job stress scale' by Shukla & Srivastava (2016)	2	0.811		3.42	0.858	0.926
Depression symptoms	Parts of Patient Health Questionnaire (PHQ-9)	4	0.572	0.230	0.57	0.812	0.901
Exhaustion	-	4	0.792		2.49	0.567	0.753
Engagement	Parts of UWES by Schaufeli & Bakker (2004a)	6	0.873		3.76	0.393	0.627
Professional Isolation	Professional Isolation by Golden et al. (2008)	7	0.848		3.15	0.556	0.746

Note: Mean inter-item correlation were also reported when minimum Cronbach Alpha requirements were not met

N= 25058

Whether the items in the multiple-item measure accurately represent the underlying construct is limited by how the questions are interpreted by the respondents. Analysis of the questionnaires revealed that they were unlikely to be misinterpreted by respondents as questions satisfied the conditions by Baarda et al. (2012) in which questions a clear, uses unambiguous language that matches the respondents level of thinking, and in which the answer possibilities exclude each other and are complete.

External validity is related to the generalizability and applicability of the research's findings in the real world (Baarda et al., 2012). It is important to note that the data used for this study is a momentary snapshot of the evolving situation of the COVID-19 pandemic in the Netherlands. Circumstances on an individual and societal level might have affected the perception of productivity, wellbeing and several health aspects, such as stress and social isolation. For this reason, the generalisability of the findings of the current study is considered to be limited.

Furthermore, the generalizability of the results of this study may also be limited to public organisations, as the questionnaires were only distributed among public organisations. Although previous research by Srivastava & Krishna (1992) found significant differences in job involvement and mental health between (Indian) private- and public sector employees, more recent research suggest no differences between public and private organisations on individual employee level: Baarspul & Wilderom (2011) found during a literature review of twenty-eight studies that there are no sector differences at the individual employee level as there is no consistent pattern of evidence in support of the widespread idea that employees in public-sector organizations behave differently from those employed in private-sector contexts.

Even though the sample differs from the population in some aspects, by being older, more male-dominated and more highly-educated compared to the Dutch labour population (as presented in the following chapter), the results are generalizable to knowledge workers in the public and private sector with similar job roles.

4.6 QUANTITATIVE ANALYSES

The data that was provided by the "We Work From Home" research project (WWH) was analysed through quantitative research methods, such as path analysis and bivariate analyses. Before path analysis can be conducted, descriptive analysis and bivariate analysis must take place.

4.6.1 DESCRIPTIVE ANALYSIS

Descriptive analysis is one of the basic stages one must go through before conducting quantitative analysis. In the descriptive analysis, the sample is described and analysed on socio-demographic factors, as well as other aspects. In this study, descriptive analysis was performed between the two surveys (week 3 and 7) on their differences in personal and environmental characteristics, as well as health aspects and perceived productivity. This analysis is performed to check if the samples are similar enough so that bivariate and path analyses only needs to be conducted on one sample, instead of both samples.

Also, socio-demographic factors, such as gender, age and education levels were compared to CBS data, to identify whether the results from this study can be generalized to the population.

4.6.2 BIVARIATE ANALYSIS

Bivariate analysis is one of the basic forms of quantitative statistical analysis and involves the analysis of the relationship between two variables and provides insights into the significance of these relationships. Which type of bivariate analysis method is used depends on the level of measurement of each variable. When the levels of measurement are determined, bivariate analysis can take place using the Chi-Square test, Independent T-test, One-Way ANOVA, or (Pearson or Spearman) correlation tests (Field, 2013). In

the current study, the bivariate analysis will only be conducted on week 3 data, as samples from both weeks were considered similar enough as concluded from the descriptive analysis.

In this study, there are several independent variables, such as gender, age, job position, and education level. These independent variables were tested on the significance of their relationship with dependent variables, such as their health and productivity. Due to differences in measurement scales of variables, it was appropriate to use several types of bivariate analysis, such as the Chi-Square test, Independent T-test, One-Way ANOVA, and (Pearson or Spearman) correlation tests (Field, 2013). Using **Table 14**, the appropriate type of bivariate analysis was determined for each relationship.

Table 14 Bivariate analyses per measurement level

<table>
<tr><th rowspan="2">Independent Variable</th><th colspan="4">Dependent Variable</th></tr>
<tr><th>Nominal (dichotomous)</th><th>Nominal (>2 categories)</th><th>Ordinal</th><th>Interval/Ratio</th></tr>
<tr><td>Nominal (dichotomous)</td><td colspan="3" rowspan="3">Chi-Square</td><td>Independent t-test</td></tr>
<tr><td>Nominal (> 2 categories)</td><td>One-way ANOVA</td></tr>
<tr><td>Ordinal</td><td>Spearman Correlation</td></tr>
<tr><td>Interval/Ratio</td><td>Independent t-test</td><td colspan="2">One-way ANOVA</td><td>Pearson Correlation</td></tr>
</table>

4.6.2.1 CHI-SQUARE (χ2) TEST

As can be concluded from Table 14, (Pearson's) Chi-Square (χ2) test was used for the analysis between dichotomous, nominal, and ordinal variables. The test compares the observed (O) frequencies in each category in the variable, with their expected (E) frequencies based on probability:

$$\chi 2 = \sum \frac{(O - E)^2}{E}$$

The test thus investigates the relationship between two categorical variables and the significance of this relationship. If the test returns a statistically significant result, the alternative hypothesis (H_a) is accepted, which is that the group means are statistically significantly different from each other. Before one can use the Chi-Square test, two assumptions must be met: the respondent's data needs to be independent (meaning the respondent cannot be part of two groups within the same variable), and the observed frequency for each category need to be larger than 5 cases, otherwise, Fisher's exact test is used (Field, 2013).

4.6.2.2 INDEPENDENT T-TEST

Independent T-tests (also called the two-sample t-test, independent-samples t-test or student's t-test) were performed to determine whether there is a statistically significant relationship between a dichotomous and interval/ratio scale variable (Field, 2013). In this test, the difference between the means of two (independent) groups was tested on their significance. If the test returns a statistically significant result, the alternative hypothesis (H_a) is accepted, which is that the two group means are statistically significantly different from each other.

Before using the independent samples t-test, three assumptions must be met (Field, 2013). Again, the two groups that are compared must be independent. Second, the distribution of the interval/ratio scale variable must be normally distributed. Thirdly, both groups must have a variance distribution which are

roughly similar. For checking this assumption, Levene's test for equality of variances can be used (Field, 2013).

4.6.2.3 ONE-WAY ANOVA

The one-way analysis of variance (ANOVA) was performed to determine whether there are statistically significant differences between the means of three or more independent groups (Field, 2013). As can be concluded from Table 14, the one-way ANOVA test was used to analyse the differences in the means of an interval/ratio variable between groups of a nominal or ordinal variable. If the test returns a statistically significant result, the alternative hypothesis (H_a) is accepted, which is that there are at least two group means that are statistically significantly different from each other.

The one-way ANOVA test does not show which specific groups are statistically significantly different from each other, only that at least two groups are. To determine which specific groups differed from each other, post hoc tests are performed – more specifically Tukey's honestly significant difference (HSD) post hoc tests (Field, 2013), which is presented in Appendix V. The same assumptions hold for the one-way ANOVA test as for the independent t-test: independent groups, a normally distributed dependent variable, and roughly the same variance distribution.

4.6.2.4 SPEARMAN AND PEARSON CORRELATION

Correlation tests measure the extent to which two variables are found to change together and describes both the strength, direction and statistical significance of this relationship. This measure results in a correlation coefficient that can range in value from −1 to +1 which reflect a perfect negative or positive linear association between the two (Field, 2013). If the test returns a statistically significant result, the alternative hypothesis (H_a) is accepted, which is that there is a statistically significant relationship between the two variables.

Three main correlation tests are often used in the bivariate analysis: Kendall, Pearson, and Spearman (Field, 2013). In this study, only the latter two were used:

- Pearson's (product-moment) correlation test was used to determine the linear relationship between two continuous (interval/ratio) variables;
- Spearman's (rank order) correlation test was used to determine the monotonic relationship between two continuous or ordinal variables and is based on ranked values for each variable.

For both Pearson's and Spearman's correlation tests the same assumptions are held. The relationships between variables are linear, and show homogeneity of variance - often called homoscedasticity. Homogeneity of variance means that the variability of the scores (or variance) for the dependent variable is constant for all values of the independent variable (Field, 2013). Pearson's correlation test requires one more assumption: data must be normally distributed (which is not required for Spearman's correlation test).

4.6.3 PATH ANALYSIS

Path analysis is a statistical technique, also known as Structural Equation Modelling (SEM), which is used to examine the comparative strength of direct and indirect relationships among variables and is often displayed in graphical diagrams showing the relationships between variables. In the current study, path analysis was only be conducted on week 3 data, as descriptive analysis reveals that the samples did not differ statistically on personal demographic factors.

Originally developed in the 1920s by Wright, the path analysis model involves a system of (structural) equations based on the correlations among variables that influence the outcome. Afterwards, the unknown parameters in the model are solved for (Lleras, 2005; Olkin & Sampson, 2001). Path analysis

utilizes information provided by statistical correlations, together with qualitative information regarding hypothesized relationships, by estimating multiple regression equations at the same time.

The path diagram represents the hypothesized model in path analysis and is similar to a conceptual model in which arrows indicate a direct causal relationship between the explanatory variable to the outcome variable. Only the variables which were found to be of significant predicting power, according to the bivariate analyses, were included in the path model. The path model also controls for other variables in determining the controlled significance of each variable. The results from the path model were used for answering the main research question.

4.6.4 MEDIATION ANALYSIS

Results from the path analysis may also be used to investigate the mediating roles of variables within the path model.

In the current research, several health aspects are considered to be mediators for the influences of personal and environmental characteristics on perceived productivity. To analyse to what extent these influences are mediated by health, the direct and indirect effects within the model are discussed. The following theoretical information in this section is based on information provided by Kenny (2018) regarding mediator variables in causal models for social psychological research.

The following model describes the concept of mediation effects (Figure 6). In this model, the effect of X on Y may be mediated by mediating variable M, while variable X may still affect Y.

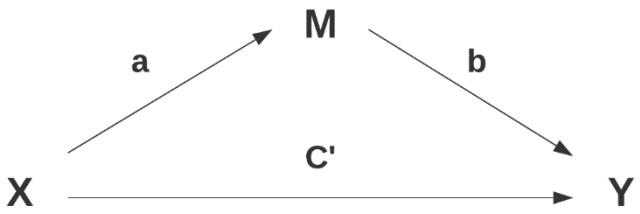

Figure 6 Causal model with mediating variable M

Path c' is called the direct effect, while path a is a direct effect from X on M. Path b is the indirect effect of M on Y. Complete mediation is the case in which variable X no longer affects Y after M has been controlled, making path c' zero. Partial mediation is the case in which the path from X to Y is reduced in absolute size but is still different from zero when the mediator is introduced. When correctly specified, the paths of a, b, and c' can be estimated by multiple regression, ordinary least squares (OLS), logistic regression, multilevel modelling, and Structural Equation Modelling (Baron & Kenny, 1986; Judd & Kenny, 1981).

In the current research, health aspects related to physical, mental, and social health are considered to be mediator variables. If there are several multiple mediators, they can be tested simultaneously or separately. The advantage of doing them simultaneously is that one learns if the mediation is independent of the effect of the other mediators (Baron & Kenny, 1986; James & Brett, 1984; Judd & Kenny, 1981).

James & Brett (1984) discussed four steps to establish (complete) mediation:

1. Show that the causal variable is correlated with the outcome. Use Y as the criterion variable in a regression equation and X as a predictor (estimate and test path c in Figure 6). This step establishes that there is an effect that may be mediated.

2. Show that the causal variable is correlated with the mediator. Use M as the criterion variable in the regression equation and X as a predictor (estimate and test path a). This step essentially involves treating the mediator as if it were an outcome variable.
3. Show that the mediator affects the outcome variable. Use Y as the criterion variable in a regression equation and X and M as predictors (estimate and test path b). It is not sufficient just to correlate the mediator with the outcome because the mediator and the outcome may be correlated because they are both caused by the causal variable X. Thus, the causal variable must be controlled in establishing the effect of the mediator on the outcome.
4. To establish that M completely mediates the X-Y relationship, the effect of X on Y controlling for M (path c') should be zero (see discussion below on significance testing). The effects in both Steps 3 and 4 are estimated in the same equation. Only when path c' is zero, one can speak of complete mediation.

The amount of mediation is called the indirect effect (James & Brett, 1984), in which the total effect = direct effect + indirect effect. Furthermore, the extent of mediation can be computed, which presents informative insights into the relationships between variables, by dividing the mediated effects by total effect of the relationship (Kenny et al. 1998):

$$proportion\ of\ mediation = \frac{ab}{y}$$

4.7 CONCLUSION

This chapter aimed to describe the methodology behind the current study and to provide a theoretical background for the various quantitative analyses that are conducted in the study. Two existing datasets were used for the current research, which were provided by the "We Work from Home" (WWH) research project. The data was collected by WWH through questionnaires between the 27th of April and the 20th of November of 2020, dependent on the cohort in which the respondent was assigned. The data contains information regarding the perceived health and productivity of obliged teleworkers from various Dutch public organisations during the COVID-19 pandemic.

Through the use of established scales and Cronbach Alpha reliability analyses, the measurements in the datasets were argued to be valid and reliable. The study's results are generalizable to knowledge workers in the public and private sectors with similar job roles. However, the generalizability is limited outside the COVID-19 pandemic by the period in which the research is conducted (COVID-19 induced lockdown in the Netherlands).

CHAPTER 5

DATA DESCRIPTION

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CHAPTER 5: DATA DESCRIPTION

The previous chapter discussed the methodology behind the current study and provided a theoretical background for the various quantitative analyses that are conducted in the study. This chapter aims to describe both datasets (week 3 and 7) and to analyse the differences between the datasets.

First, the sample sizes are discussed. Second, the personal characteristics of the respondents in the samples are discussed and analysed for differences between the samples, followed by similar analyses regarding environmental characteristics, perceived health and perceived productivity.

5.1 SAMPLE DESCRIPTION

As stated in Section 4.1, this study uses existing data from weeks 3 and 7 from the "We Work from Home" research project (WWH). Initially, the dataset contained 30,956 responses and 23,003 responses from the surveys from weeks 3 and 7, respectively. As expected, a decrease in the number of respondents each week was found. The number of responses in the datasets was reduced after removing invalid responses, such as incomplete responses and those with missing cases on important aspects such as productivity, health, personal and environmental characteristics. This resulted in a research sample of 25,058 and 18,859 valid responses for weeks 3 and 7.

5.2 PERSONAL CHARACTERISTICS

This section discusses the distribution of the personal characteristics of the sample. Table 15 shows the personal characteristics of the respondents.

Table 15 Descriptive statistics - Personal characteristics

Personal Characteristics		SURVEY WEEK 3		SURVEY WEEK 7		CBS DATA
		Frequency	Sample (%)	Frequency	Sample (%)	%
Cohort	Cohort 1	5138	20.5%	3683	19.5%	
	Cohort 2	10204	40.7%	8020	42.5%	
	Cohort 3	9716	38.8%	7156	37.9%	
Gender	Male	11798	47.1%	8964	47.5%	49.7%
	Female	13142	52.4%	9819	52.1%	50.3%
	Other	118	0.5%	76	0.4%	0.01%
Age	≤30 years old	2145	8.6%	1436	7.6%	25.2%
	31-40 years old	4010	16.0%	2885	15.3%	18.5%
	41-50 years old	5764	23.0%	4406	23.4%	19.8%
	51-60 years old	9360	37.4%	7157	38.0%	19.7%
	>60 years old	3779	15.1%	2975	15.8%	16.7%
Job role	Management employee	1724	6.9%	1286	6.8%	
	Regular employee	23334	93.1%	17573	93.2%	
Level of education	Primary & Secondary education	1633	6.5%	1119	5.9%	37.6%
	MBO	4349	17.4%	3113	16.5%	28.8%
	HBO	10115	40.4%	7815	41.4%	21.3%
	University	8763	35.0%	6678	35.4%	11.5%
	Other	198	0.8%	134	0.7%	0.8%
Sedentary behaviour	*N*	*25058*		18859		
% of time in the workday that is	*Mean*	*81.11*		*81.50*		
spent sitting	*Standard deviation*	*13.539*		*13.216*		
Physical Activity	*N*	*25058*		18859		
# of days per week with a	*Mean*	*4.24*		*3.79*		
minimum of 30 minutes of	*Standard deviation*	*2.050*		*2.018*		
Workload since WFH	Increased workload	6715	26.8%	5063	26.8%	
	Similar workload	15744	62.8%	12104	64.2%	
	Decreased workload	2599	10.4%	1692	9.0%	

COHORT

It is found that the largest proportion of respondents was part of cohort 2. This means that most respondents filled in the questionnaires between the 20th of July and the 9th of August 2020 for week 3, and that the survey from 'week 7' was filled in between the 17th of August and the 6th of September

2020. A decline in response can be seen between the two questionnaires. No statistical differences were found between samples in the distribution of respondents among cohorts *(t= -0.309; p= 0.757).*

GENDER

The first demographical variable is the gender of the respondent. As shown in Table 15, there are more female respondents than male respondents. Also, a small proportion of the sample identifies as another gender (non-binary/neither male nor female). Results from One-Sample t-Tests between the sample from week 3 and week 7 indicate that there is no significant difference in gender between the samples *(t= 1.610; p= 0.107).*

When comparing both samples to data by CBS (2020a) it is found that there are significant differences between the samples and the Dutch population *(week 3: t= 9.525; p=0.000; week 7: t=6.881; p=0.000).* This significant difference between the population and sample is mostly associated with the lack of data from CBS on transgendered persons (CBS, 2011).

AGE

The second variable is the respondent's age. Initially, age contained six categories, of which the categories '< 21 years old' and '21-30 years old' were merged due to the first category only containing six cases in week 3 and week 7. It is found that the samples of week 3 and week 7 are significantly different in distribution *(t= -6.252; p= 0.000)* using One-Sample t-Tests, even though they appear quite similar in age distribution. This is most likely the case due to the large sample size.

Also, the age of the sample was found to be significantly higher than the age of the Dutch labour-force population *(week 3: 68.513; p= 0.000 & week 7: 65.923; p= 0.000)* (CBS, 2020a). This significant difference between the population and sample is mostly associated with the small proportion of young persons in the samples. This finding is supported by research by Hulzebosch et al. (2017), in which it was found that the mean age of employees working for the Dutch government is 48.1 years old, and will continue to grow when the Dutch age of retirement goes up.

JOB ROLE

The third variable is the respondent's job position. Initially, this variable contained four categories (director, manager, employee, teacher) of which the first two and last two were merged for the same reason. It was found that the largest proportion of respondents in the sample are 'regular' employees, and about 9% of respondents are management employees (either directors or managers). Results from One-Sample t-Tests between the sample from week 3 and week 7 indicate that there is no significant difference in job roles between the samples *(t= -0.382; p= 0.703)*.

EDUCATION LEVEL

The fourth variable is education level. Initially, the education level variable contained six categories. The first two categories 'primary and secondary education' were merged because the first category only contained 44 cases. After merging, education level contained 5 categories: *1) Primary and Secondary Education, 2) MBO, 3) HBO, 4) University,* and *5) other education.* It is found that the sample is highly educated due to the proportion of respondents that have completed HBO and university level(s) of education.

Results from One-Sample t-Tests between the sample from week 3 and week 7 indicate that there are significant differences in education levels between the samples *(t= -4.034; p= 0.000)* even though sample distributions appear fairly similar. This is also the case between the samples and the Dutch labour-force population (*week 3: 170.530; p= 0.000 & week 7: 154.711; p= 0.000)* (CBS, 2020b).

SEDENTARY BEHAVIOUR

As briefly described in Chapter 3, spending long hours while remaining seated without breaks, is considered risky behaviour that contributes to the development of musculoskeletal problems in the neck, shoulders, wrist, hand and back (Crawford et al., 2011; Skov et al., 1996). Data from both samples reveal that teleworkers spent a large percentage of their workday seated (81.11%). One-Sample t-Tests reveal that teleworkers in week 7 were seated significantly more during their workday compared to week 3 data *(t= -4.567; p= 0.000).*

PHYSICAL ACTIVITY

Descriptive analysis reveals that, on average, respondents are able to perform physical activity of at least 30 minutes roughly four out of seven days per week. A significant decrease is found in the number of days that respondents performed physical activity of at least 30 minutes *(t= 34.852; p= 0.000).*

WORKLOAD SINCE WORKING FROM HOME

Respondents were asked whether their workload had increased, decreased or remained (roughly) similar since they started working from home. Descriptive analysis revealed that most respondents' workload remained the same when starting to work from home. A quarter of the respondents experienced an increase in workload, while around 10% experienced a decrease. A significantly larger workload was found in week 7 – as more people experienced an increase in workload compared to week 3 *(t= -3.906; p= 0.000).*

5.3 ENVIRONMENTAL CHARACTERISTICS

This section discusses the distribution of the environmental characteristics of the sample, presented in Table 16. These include the type of home office the respondent works in most often, and the level of organisational support the respondent perceived.

Table 16 Descriptive statistics - Environmental characteristics

Environmental Characteristics			SURVEY WEEK 3		SURVEY WEEK 7	
			Frequency	Sample (%)	Frequency	Sample (%)
At-home workspace	Furnished workspace	No	10088	*40.3%*	6915	*36.7%*
		Yes	14970	*59.7%*	11944	*63.3%*
	Enclosed workspace	No	8606	*34.3%*	6265	*33.2%*
		Yes	16452	*65.7%*	12594	*66.8%*
Household characteristics	Partner	No	6029	*24.1%*	4525	*24.0%*
	based on household type	Yes	19029	*75.9%*	14334	*76.0%*
	Children	No	13746	*54.9%*	10363	*54.9%*
	based on household type	Yes	11312	*45.1%*	8496	*45.1%*
	Living with others	No	3886	*15.5%*	2905	*15.4%*
	based on household type	Yes	21172	*84.5%*	15954	*84.6%*
	Perceived Organisational Support	*N*	*25058*		18859	
	on a scale from 1 (very low) to	*Mean*	*3.247*		*3.252*	
	(very high)	*Standard deviation*	*0.773*		*0.753*	

FURNISHED WORKSPACE

As described in Section 4.4.1, respondents stated whether their most often used workspace was furnished for office-type work (e.g. suitable desk, office chair, laptop stand, second screen, separate keyboard) or not. Descriptive analysis revealed that roughly 60% of respondents worked from a workspace that was furnished for office-type work. This means that around 40% of the sample did not. One-Sample t-Tests revealed a significant increase in the number of respondents that worked from furnished workspaces in week 7, compared to week 3 *(t= -11.593; p= 0.000).*

ENCLOSED WORKSPACE

Descriptive analysis revealed that roughly 65% of respondents worked in an enclosed workspace, separated from other activities in the home. One-Sample t-Tests revealed a slight, but significant, increase in the number of respondents that worked from enclosed workspaces in week 7, compared to week 3 *(t= -3.747; p= 0.000)*.

HOUSEHOLD CHARACTERISTICS

As described in Section 4.4.1, respondents stated the composition of their household (e.g. single-person household, couple without children, etc.). Using this information, dummy variables were coded dependent on whether the respondent had a partner, had children, and lived with others or not.

Descriptive analysis revealed that most respondents have a partner (75%). One-Sample t-Tests revealed no significant differences between the week 3 and week 7 sample *(t= -0.246; p= 0.*806) on this household characteristic. Similarly, the descriptive analysis revealed that most respondents did not have children (55%). Also, no significant differences between the week 3 and week 7 samples were found on this characteristic *(t= 0.296; p= 0.767)*. Last, it was revealed that relatively few respondents lived alone (roughly 15%). No significant differences in this characteristic were found between week 3 and week 7 *(t= -0.456; p= 0.649)*.

PERCEIVED ORGANISATIONAL SUPPORT

As stated in Section 4.4.1, perceived organisational support was measured using 4 questions, of which the mean of these answers is used as an 'organisational support score'. This score ranges from very low (=1) support to very high support (=5). For both weeks, a mean perceived organisational support score of 3.25 was found. Using One-Sample t-Tests, it was found that the samples of week 3 and week 7 were not significantly different *(t=-0.980; p=0.327)*. This variable is roughly normally distributed, even though Kolmogorov-Smirnov Tests were not significant.

For week 3, a skewness of -0.396 and a Kurtosis measure of 0.155 is found, meaning the distribution is left-skewed and within ranges of normal distribution (skewness between -1 and +1). Similarly, for week 7, a skewness of -0.427 and a Kurtosis measure of 0.133 is found, meaning the distribution is also left-skewed and within ranges of normal distribution.

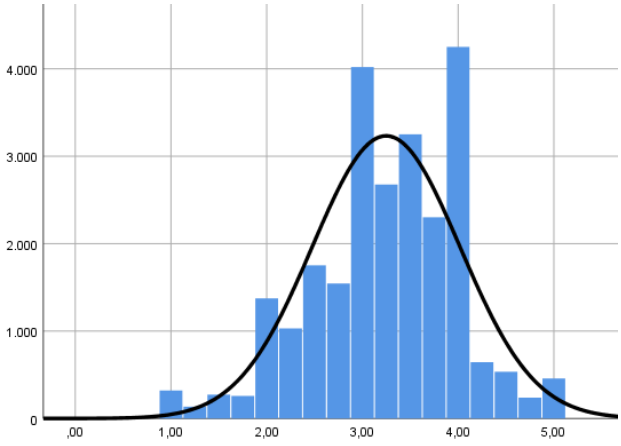


Figure 7 Distribution of Perceived Organisational Support week 3

5.4 HEALTH

In this section, the reported health of the respondents in the datasets are discussed. In both surveys, questions were asked regarding the physical, mental, and social health of the respondent. Table 17 shows that the number of persons that experienced health problems differed significantly between both samples.

Table 17 Descriptive statistics - Health

Health				SURVEY WEEK 3 Frequency	SURVEY WEEK 3 Sample (%)	SURVEY WEEK 7 Frequency	SURVEY WEEK 7 Sample (%)
No health problems				5953	*23.8%*	13530	*71.7%*
Physical Health	Number of Musculoskeletal Problems		*N*	*25058*		*18859*	
			Mean	0.98		0.43	
			Standard deviation	1.055		0.868	
	Number of SBS Symptoms		*N*	*25058*		*18859*	
			Mean	0.35		0.12	
			Standard deviation	0.597		0.379	
Mental Health	Occupational Stress	Job Stress score *(Jamal & Baba, 1992)*	*N*	*25058*		*18859*	
			Mean	*2.47*		*2.44*	
			Standard deviation	*0.787*		*0.773*	
		Work-life Balance score *(Brough et al., 2009)*	*N*	25058		*18859*	
			Mean	*3.42*		*3.45*	
			Standard deviation	*0.926*		*0.910*	
	Number of Depression Symptoms		*N*	*25058*		*18859*	
			Mean	0.57		0.22	
			Standard deviation	0.901		0.664	
	Exhaustion		*N*	*25058*		*18859*	
			Mean	*2.49*		*2.48*	
			Standard deviation	*0.753*		*0.753*	
	Engagement (Schaufeli & Bakker, 2004)		*N*	*25058*		*18859*	
			Mean	*3.76*		*3.70*	
			Standard deviation	*0.627*		*0.630*	
Social Health	Professional isolation (Golden et al., 2008)		*N*	*25058*			
			Mean	*3.15*			
			Standard deviation	*0.746*			

In data from week 7, it was found that 69.7% reported having no health problems such as pain in the neck, back, joints, headaches, or symptoms of depression. In week 3 however, only 23.8% of respondents reported having none of the aforementioned health problems. Although this significant difference in the absence of health problems between the two samples *(t= 138.000; p= 0.000)* cannot be explained by the dataset, a subtle difference in how the question is framed could cause the difference between the samples:

Week 3: *"Have you developed the following complaints during the past 4 weeks?"* in which the last option to select was 'no health problems';

Week 7: *"Have you developed any health problems since you were obliged to work from home?"* where the respondent was able to select either yes or no. When the respondent selected 'yes', the health problems he/she suffers from could be selected. Only when selecting 'yes' will the respondent be able to see which health problems can be selected.

This difference may be explained by a concept called 'anchoring bias', described as "*a process whereby people are influenced by specific information given before a judgement"* (Furnham & Boo, 2011, p. 35). The anchoring bias is a cognitive bias describing the human tendency to rely too heavily on the first piece of information that is offered (the 'anchor') when making decisions. The anchoring bias can be used during negotiation, sales and other situations.

Anchoring bias is possibly a reason for why there is such a difference between the samples: Respondents in week 3 were anchored to health problems such as pain in the neck or back, and seeing all the possible health problems may have affected how they experience their health. Also, due to the way the health question in week 7 is framed, respondents did not know what did, and what did not qualify as a health

problem. Therefore, they are much less likely in stating they have health problems. Also, it is possible that respondents interpreted the concept of "health problem" differently.

Arguably, there is no correct way of asking this question. Both ways affect the likelihood of whether the respondent fills in whether he/she experiences health problems. It is suggested that the way the questions in week 3 are framed increased the likelihood of reporting health problems, while the framing in week 7 did the opposite. Due to this difference in the way the health of teleworking respondents was framed, comparing the two samples on this aspect was found to be impossible.

5.4.1 PHYSICAL HEALTH

For week 3 it is found that 14,348 reported experiencing musculoskeletal problems while working from home. For example, 40.5% of respondents reported experiencing pain in their neck and/or shoulders, followed by 27.8% of respondents suffering from pain in their lower back. It is important to note that these problems are not mutually exclusive, and thus respondents can suffer from both problems. Also, quite a large group of respondents reported suffering from headaches (20.6%) and irritation of the eyes, nose and/or throat (14.9%).

When counting the number of musculoskeletal problems (max=4) respondents suffered from, a mean of 0.98 was found for week 3 data. For week 7, a mean of 0.43 was found. A One-Sample t-test between the two samples found significant differences between them (*t= 81.916; p= 0.000).* Headaches were the most often reported SBS symptom (20.6% in week 3; 6.9% in week 7). When counting the number of SBS symptoms respondents suffered from, a mean of 0.35 was found for week 3 data. For week 7, a mean of 0.12 was found. A One-Sample t-test between the two samples found significant differences between them (*t= 62.237 p= 0.000).*

5.4.2 MENTAL HEALTH

For this study, as described in Section 3.1.2, mental health is divided into four parts: occupational stress, symptoms of depression, exhaustion and engagement. Each is discussed in more detail below.

OCCUPATIONAL STRESS

In week 3 a mean job-stress score on a scale from 1 (=very low stress) to 5 (=very high stress) of 2.47 was found. For week 7 a mean job-stress score of 2.44 was found. Using a One-Sample t-Test it was found that the samples of week 3 and week 7 were significantly different *(t=5.040; p=0.000)*.

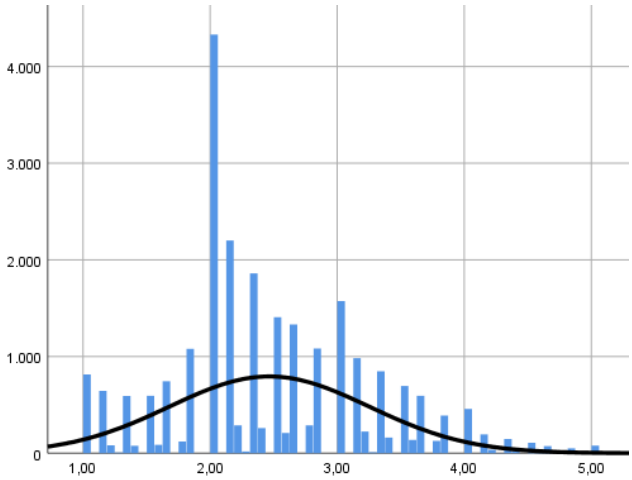


Figure 8 Job Stress - Week 3

Job stress was found to be roughly normally distributed. For week 3, a skewness of 0.476 and a Kurtosis measure of 0.036 was found, meaning the distribution is right-skewed and within ranges of normal

distribution (skewness between -1 and +1). Similarly, for week 7, a skewness of 0.493 and a Kurtosis measure of 0.105 was found, meaning the distribution is also right-skewed and within ranges of normal distribution.

Similarly, in week 3 a mean work-life balance 'score' on a scale from 1(=very low balance) to 5 (=very high balance) of 3.42 was found. For week 7 a mean work-life balance score of 3.4506 was found. Using a One-Sample t-Test, it was found that the samples of week 3 and week 7 were significantly different *(t= -4.805; p=0.000)*. Also, work-life balance is roughly normally distributed. For week 3, a skewness of -0.448 and a Kurtosis measure of -0.424 is found, meaning the distribution is left-skewed and within ranges of normal distribution (skewness between -1 and +1). Similarly, for week 7, a skewness of -0.519 and a Kurtosis measure of -0.308 is found, meaning the distribution is also left-skewed and within ranges of normal distribution.

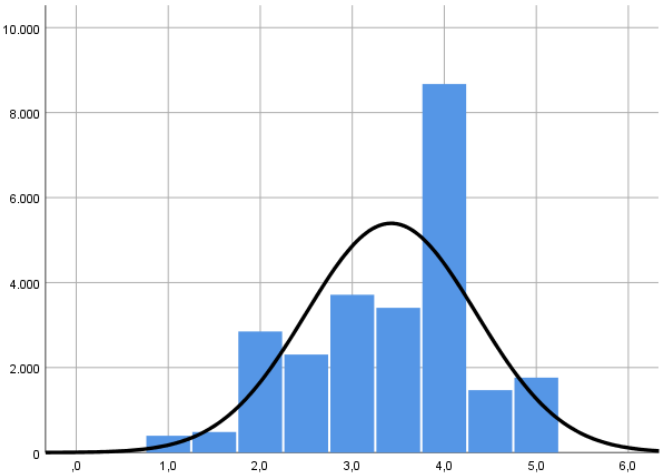


Figure 9 Work-life balance - Week 3

SYMPTOMS OF DEPRESSION

For week 3 and week 7 it was found that quite some respondents suffer from concentration problems while working from home (week 3: 26.2% and week 7: 8.3%). 26.2% of respondents reported having difficulty concentrating on tasks, and 15% reported having little interest or enjoyment in doing things. 8.9% of respondents reported feeling gloomy, depressed or hopeless, and 6.6% reported experiencing poor appetite or overeating.

When calculating the number of depressive e symptoms respondents suffered from, a mean of 0.57 was found for week 3 data. For week 7, a mean of 0.22 was found. A One-Sample t-test between the two samples found significant differences between them (*t= 61.015 p= 0.000).*

EXHAUSTION

In week 3 a mean exhaustion on a scale from 1 (=very low exhaustion) to 5 (=very high exhaustion) of 2.4933 was found. For week 7 a mean exhaustion of 2.4796 was found. Using a One-Sample t-Test, it was found that the samples of week 3 and week 7 were significantly different *(t= 2.876; p= 0.004)*. Also, exhaustion was found to be roughly normally distributed. For week 3, a skewness of 0.385 and a Kurtosis measure of -0.009 was found, meaning the distribution is right-skewed and within ranges of normal distribution (skewness between -1 and +1).

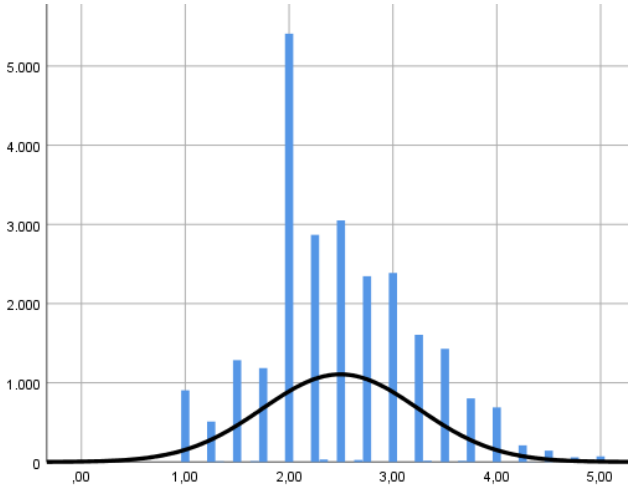


Figure 10 Exhaustion - Week 3

Similarly, for week 7, a skewness of 0.478 and a Kurtosis measure of 0.131 was found, meaning the distribution is also right-skewed and within ranges of normal distribution.

ENGAGEMENT

In week 3, a mean engagement on a scale from 1 (=very low engagement) to 5 (=very high engagement) of 3.76 was found. For week 7 a mean job-stress score of 3.70 was found. Using a One-Sample t-test, it was found that the samples of week 3 and week 7 were significantly different *(t= 14.987; p= 0.000)*. Also, engagement is roughly normally distributed. For week 3, a skewness of -0.434 and a Kurtosis measure of 0.861 was found, meaning the distribution is left-skewed and within ranges of normal distribution (skewness between -1 and +1).

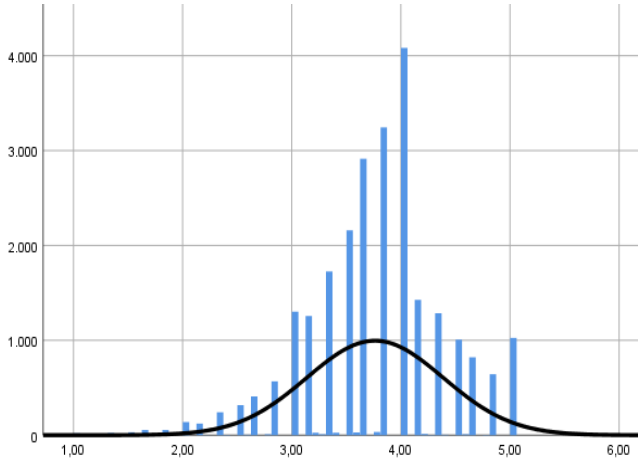


Figure 11 Engagement - Week 3

Similarly, for week 7, a skewness of -0.445 and a Kurtosis measure of 1.051 was found, meaning the distribution is also left-skewed and within ranges of normal distribution.

5.4.3 SOCIAL HEALTH

The seven items that are part of the Professional Isolation scale by Golden et al. (2008) is used in questionnaire week 3, but not in week 7. In week 3 a mean professional isolation of 3.153 was found on a scale from 1 (=very low professional isolation) to 5 (=very high professional isolation). Professional isolation is fairly normally distributed. A skewness of -0.228 and a Kurtosis measure of -0.108 was found, meaning the distribution is left-skewed and within ranges of normal distribution (skewness between -1 and +1). Professional isolation was not measured in the week 7 questionnaire.

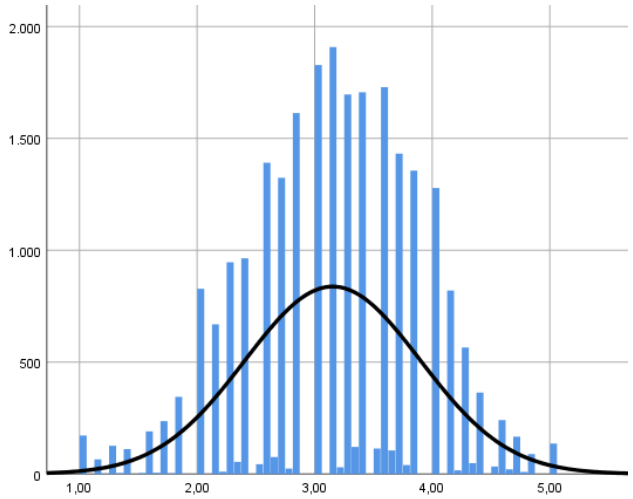


Figure 12 Professional Isolation - Week 3

5.5 PERCEIVED PRODUCTIVITY

In this study, employee productivity is measured by the employees themselves and thus is a perceived productivity measurement. This self-rated individual productivity is measured on a scale from 1 (worst) to 10 (best).

Table 18 Descriptive statistics - Productivity

		SURVEY WEEK 3		SURVEY WEEK 7	
		Frequency	Sample (%)	Frequency	Sample (%)
Perceived productivity	*N*	25058		*18859*	
on a scale from 1 (very low) to	*Mean*	*7.59*		*7.59*	
10 (very high)	*Standard deviation*	*1.217*		*1.214*	

In both samples, mean productivity of 7.59 was found. Using a One-Sample t-Test, it was found that the samples of week 3 and week 7 were statistically very similar *(t=0.001; p=0.999).*

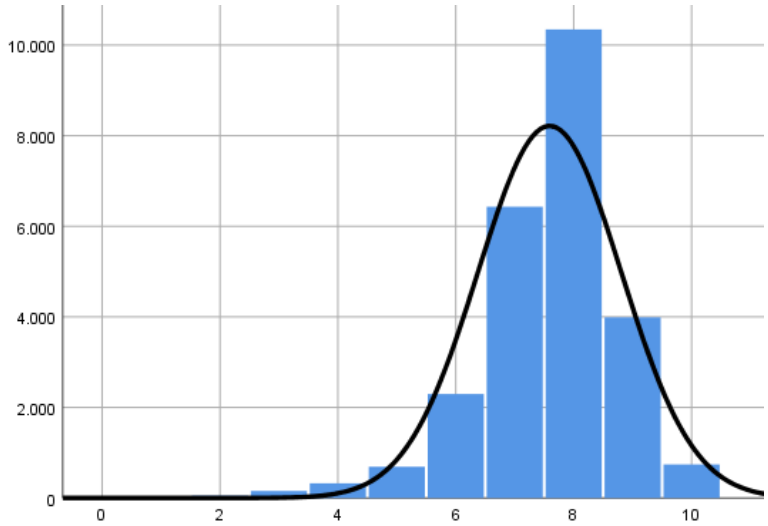


Figure 13 Perceived productivity - Week 3

It is clear from **Figure 13** that perceived productivity was normally distributed and is left-skewed for both week 3 (skewness -1.074 and Kurtosis 2.827) and week 7 (skewness -1.145 and Kurtosis 3.160).

5.6 CONCLUSION

This chapter aimed to describe both datasets and analyse the differences between the two datasets. After data-cleaning the research samples, consisting of 25,058 and 18,859 valid responses, were described. It was found that the sample from weeks 3 and 7 are fairly similar in gender, job position, and household characteristics. Conversely, statistically significant but very small differences between the samples were found on age and education distributions. The samples differed significantly from the Dutch labour force, as Dutch public organisations were found to be relatively old, male-dominated and highly-educated in general, which is supported by research by Hulzebosch et al. (2017).

Significant differences were found between week 3 and week 7 samples on the respondent's most used at-home workspaces, while perceived organisational support was similar between the two samples. A large difference between samples was found for the distribution of respondents without health problems, most likely due to the psychological effect of the question's phrasing regarding this topic (anchoring). The continuous health variables were found to be roughly normally distributed, but the means differed significantly between samples. This suggests that the effects of working from home have worsened or weakened slightly over time. It is possible that this is caused by the way some of the variables are operationalized. Productivity was found to be similar between sample means.

Data from week 3 and week 7 were found to not be identical, but still largely similar when looking at **Table 15** and **Table 16**. Therefore, based on these findings, it is determined that only week 3 will be analysed through bivariate and path analyses, while week 7 is used to try to explain some of the results of the current research.

CHAPTER 6

BIVARIATE ANALYSES

Photo by Viktoria Slowikowska from Pexels

CHAPTER 6: BIVARIATE ANALYSES

The previous chapter discussed the research samples and their respective differences. Very small, but statistically significant differences were found on respondent age and education distributions. As only relatively small differences were found between the samples, it was determined to perform the bivariate analyses and path analysis on the research sample of week 3.

This chapter aims to analyse the relationships between two variables, the significance of this relationship, and to provide input for the path analysis which is conducted in Chapter 7. In this study, relationships that are considered statistically significant are associated with a p-value of .05 or lower, which is the same as a 95% confidence interval. The results which are presented in this chapter are ordered as follows (also presented with section numbers in ***Figure 14****): First, the bivariate relationships of personal characteristics on environmental characteristics, health and productivity are discussed. Second, the bivariate relationships of environmental characteristics on health and productivity are discussed, as well as inter-group relationships of environmental factors. Last, the bivariate relationships of health on productivity are discussed, as well as relationships of health aspects on other health aspects.*

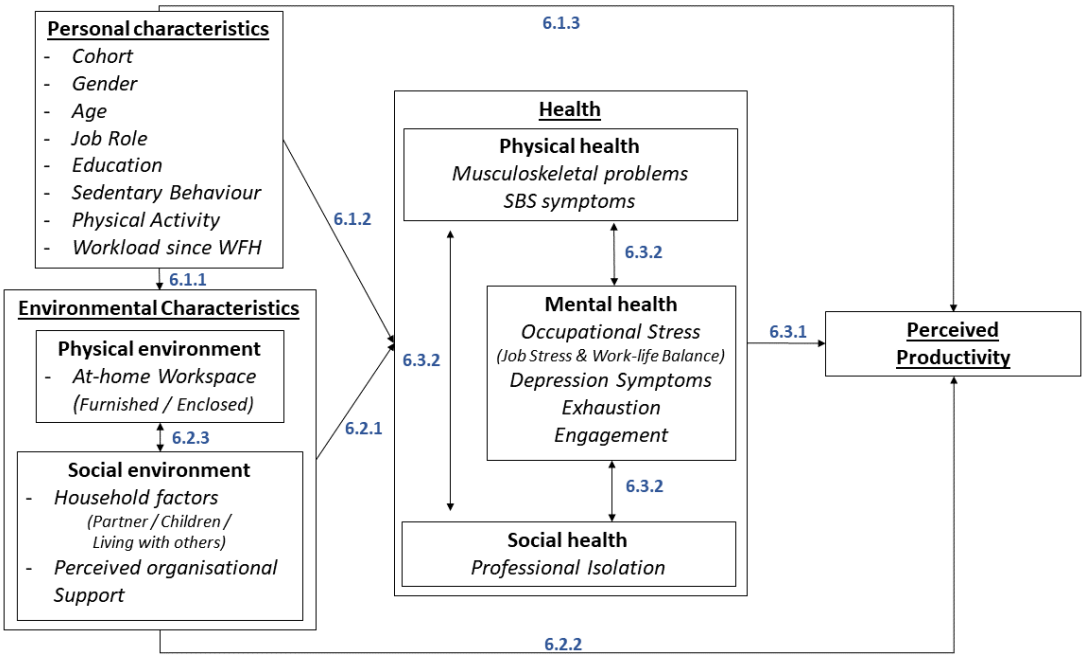


Figure 14 Conceptual Model Bivariate Analyses indicating the sections that address the different relationships

For a complete overview of the significance and magnitude of the bivariate relationships in the model, see Table 47 at the end of the chapter in which effect size estimates are presented.

6.1 PERSONAL CHARACTERISTICS

In this section, the bivariate analyses that were conducted to investigate the relationships between personal characteristics and various dependent variables, such as environmental characteristics, health and productivity, are discussed. The personal characteristics that are included in this study are: *1) cohort (nominal), 2) gender (nominal), 3) age (ordinal), 4) job role (non-managerial or managerial role = dichotomous) 5) education (ordinal), 6) sedentary behaviour (interval), 7) physical activity (ratio),* and *8) workload since working from home (nominal).*

6.1.1 RELATIONSHIPS BETWEEN PERSONAL AND ENVIRONMENTAL CHARACTERISTICS

To investigate the relationships between personal characteristics and environmental characteristics, four types of bivariate analyses were conducted: Chi-Square, Independent t-test, One-Way ANOVA, Spearman and Pearson correlation tests.

The environmental characteristics that were analysed are the at-home workspace (furnished workspace and enclosed workspace, both dichotomous variables), household characteristics (partner, children and living with others, all dichotomous variables), perceived organisational support (interval).

Table 19 Chi-Square test: Personal characteristics and Environmental characteristics (N= 25058)

Independent Variable	df	Furnished Workspace		Enclosed Workspace	
		χ2	Sig.	χ2	Sig.
Cohort	2	54.443**	.000	65.737**	.000
Gender	2	43.586**	.000	107.495**	.000
Age	4	69.121**	.000	87.858**	.000
Job Role	1	1.499	.221	9.324**	.002
Education Level	3	153.568**	.000	152.613**	.000
Workload since WFH	2	88.519**	.000	88.921**	.000

Independent Variable	df	Partner (no/yes)		Children (no/yes)		Living w/ Others (no/yes)	
		χ2	Sig.	χ2	Sig.	χ2	Sig.
Cohort	2	19.617**	.000	13.304**	.001	3.102	.212
Gender	2	186.656**	.000	10.631**	.005	37.744**	.000
Age	4	462.079**	.000	3654.210**	.000	142.905**	.000
Job Role	1	70.494**	.000	50.527**	.000	62.170**	.000
Education Level	3	0.823	.844	33.688**	.000	4.918	.178
Workload since WFH	2	2.331	.312	22.536**	.000	7.267*	.026

** Significant at the 0.01 level (2-tailed)

* Significant at the 0.05 level (2-tailed)

Significant differences were found between personal characteristic groups and dichotomous-scale environmental characteristics, using Chi-Square tests and Independent t-tests. First, significant gender differences were found for the at-home workspace and household factors, in which men were more likely to work from furnished and enclosed workspaces compared to women and non-binary respondents.

Age was found to be significantly related to the at-home workspace and household factors, in which older respondents were more likely to work from a furnished and enclosed workspace compared to younger respondents. Also, older adults were more likely to have a partner compared to younger respondents, while respondents aged 31-40 and 41-50 years old were more likely to have children living at home. Job role was also found to be significantly related to household factors, in which management employees were more likely to have a partner, children and live with others, compared to regular employees. Education level was also found to be significantly related to the at-home workplace, as highly-educated teleworkers were more likely to work from furnished and enclosed workspaces compared to those with lower educational attainment.

Respondents that reported a decrease in workload since they started working from home were found to be less likely to work from furnished and enclosed workspaces, compared to respondents with similar or increased workloads. Also, it was found that respondents with children were more likely to report an increased workload since they started working from home, compared to respondents with no children.

Table 20 Independent t-test: Personal characteristics and Environmental characteristics (N= 25058)

Dependent Variable	Sedentary Behaviour			Physical Activity		
	Mean	t-value	Sig.	Mean	t-value	Sig.
Furnished Workspace		-5.144	.000		5.427	.000
Not Furnished	80.57			4.16		
Furnished	81.47			4.30		
Enclosed Workspace		-6.714	.000		-6.263	.000
Not Enclosed	80.32			4.13		
Enclosed	81.52			4.30		
Partner		-0.265	.791		-0.277	.782
No Partner	81.07			4.24		
Partner	81.12			4.24		
Children		-0.433	.658		8.580	.000
No Children	81.08			4.34		
Children	81.15			4.12		
Living with Others		0.947	.343		2.596	.009
Not living with others	81.30			4.32		
Living with others	81.07			4.23		

Independent Variable	Perceived Organisational Support		
	Mean	t-value	Sig.
Job Role		1.431	.152
Management Employee	3.2726		
Regular Employee	3.2450		

Using independent t-tests, it was found that there were significant differences between respondents in furnished or enclosed workspaces and their sedentary behaviour and being physically active. Respondents in furnished and enclosed workspaces were seated for a longer period of time during their workday compared to those who work in non-enclosed and non-furnished workspaces. Conversely, respondents in furnished and enclosed workspaces were physically active for more days during the week compared to those who work in non-enclosed and non-furnished workspaces. It was also found that respondents that have no children, as well as those that live alone, were more physically active compared to those with children or those living with others.

Using One-Way ANOVA tests, it was found that there were significant differences in the mean perceived organisational support and several personal characteristics.

Table 21 One-Way ANOVA: Personal characteristics and Environmental characteristics (N= 25058)

Independent Variable	Perceived Organisational Support			
	Mean	St. Dev	F	Sig.
Cohort			122.080	.000
Cohort 1	3.3273	.75227		
Cohort 2	3.1561	.78268		
Cohort 3	3.2998	.76377		
Gender			22.489	.000
Male	3.2240	.77532		
Female	3.2705	.76894		
Other	2.9110	.83175		
Workload since WFH			126.821	.000
Decreased	3.1628	.83667		
Similar	3.3062	.74992		
Increased	3.1404	.78590		

It was found that cohorts 1 and 3 had significantly higher org perceived organisational support compared to respondents in cohort 2. Significant differences were also found between cohorts 1 and 3 on perceived organisational support – in which cohort 1 experienced higher perceived organisational support than cohort 3. Furthermore, it was found that respondents with non-binary/other genders reported significantly lower perceived organisational support compared to males and females – in which females experienced the highest support. Additionally, it was revealed that respondents with similar workloads (since they started working from home) experienced significantly higher perceived organisational support than those with increased and decreased workloads.

Table 22 Correlation tests: Personal characteristics and Environmental characteristics (N= 25058)

	Independent Variable	Perceived Organisational Support
Spearman	Age	-.028**
	sig. (2-tailed)	*.000*
	Education level	-.072**
	sig. (2-tailed)	*.000*

	Independent Variable	Perceived Organisational Support
Pearson	Sedentary Behaviour	-.095**
	sig. (2-tailed)	*.000*
	Physical Activity	.095**
	sig. (2-tailed)	*.000*

** Significant at the 0.01 level (2-tailed)

* Significant at the 0.05 level (2-tailed)

Using correlation tests, it was found that age, education levels, sedentary behaviour and physical activity were significantly related to perceived organisational support: only very weak relationships were found between both age and education and perceived organisational support. Similarly, only weak relationships were found between sedentary behaviour, physical activity and perceived organisational support, in which physical activity was found to be positively related to perceived organisational support.

6.1.2 RELATIONSHIPS BETWEEN PERSONAL CHARACTERISTICS AND HEALTH

To investigate the relationships between personal characteristics and health, three types of bivariate analyses were conducted: Independent t-test, One-way ANOVA, Pearson's and Spearman's correlation tests. The health aspects that were analysed are physical health problems (ratio-scale musculoskeletal problems and SBS symptoms), mental health aspects such as job stress and symptoms of depression (interval and ratio-scale), as well as the social health aspect of professional isolation (interval-scale).

6.1.2.1 PHYSICAL HEALTH

Starting with One-Way ANOVA tests, it was found that the cohort in which the respondent filled in the survey, the gender of the respondent and the workload they experience since working from home, have significant relationships with musculoskeletal health and the number of SBS symptoms that are experienced (Table 23).

It was found that respondents in cohort 3 reported poorer musculoskeletal health compared to respondents from cohorts 2 and 1. Furthermore, men were found to experience significantly fewer musculoskeletal problems and SBS symptoms than women and persons of non-binary genders. Respondents that reported a similar workload since working from home were found to experience

significantly fewer musculoskeletal problems and SBS symptoms, compared to those with increased or decreased workloads.

Table 23 One-Way ANOVA: Personal characteristics and Physical Health (N= 25058)

Independent Variable	# of Musculoskeletal Problems				# of SBS Symptoms			
	Mean	St. Dev	F	Sig.	Mean	St. Dev	F	Sig.
Cohort			20.269	.000			12.910	.000
Cohort 1	0.90	1.009			0.32	.573		
Cohort 2	0.98	1.059			0.35	.596		
Cohort 3	1.01	1.073			0.38	.609		
Gender			213.350	.000			121.946	.000
Male	0.83	.998			0.29	.555		
Female	1.11	1.088			0.41	.627		
Other	1.09	1.054			0.41	.588		
Workload since WFH			130.797	.000			120.076	.000
Decreased	1.03	1.069			0.37	.606		
Similar	0.90	1.023			0.31	.567		
Increased	1.14	1.103			0.45	.649		

Independent t-tests on the relationship between job role and physical health revealed that job role was not related to the number of musculoskeletal problems and SBS symptoms one suffers from (Table 24).

Table 24 Independent t-test: Job Role and Physical Health (N= 25058)

Independent Variable	# of Musculoskeletal Problems			# of SBS Symptoms		
	Mean	t-value	Sig.	Mean	t-value	Sig.
Job Role		-1.745	.081		0.269	0.788
Managerial role	0.93			0.36		
Non-managerial role	0.98			0.35		

Spearman and Pearson correlation tests reveal significant relationships between age, education level, sedentary behaviour, physical activity and physical health (Table 25). Age was found to be related to musculoskeletal health and the number of SBS symptoms one experiences, as older respondents were found to experience fewer musculoskeletal problems and SBS symptoms compared to younger respondents. Sedentary behaviour was also found to be significantly related to musculoskeletal health and the number of SBS symptoms one experiences, as poor sedentary behaviour (much time spent sitting/little alteration between sitting and moving) is associated with experiencing more physical health problems. Similarly, physical activity was found to be negatively related to the number of musculoskeletal problems and SBS symptoms one experiences, as physically active respondents reported greater physical health.

Table 25 Spearman and Pearson correlation tests: Personal characteristics and Physical Health (N= 25058)

		Dependent Variable	
	Independent Variable	# of Musculoskeletal Problems	# of SBS Symptoms
Spearman	Age	-0.123**	-0.130**
	sig. (2-tailed)	*.000*	*.000*
	Education level	0.048**	0.076**
	sig. (2-tailed)	*.000*	*.000*

		Dependent Variable	
	Independent Variable	# of Musculoskeletal Problems	# of SBS Symptoms
Pearson	Sedentary Behaviour	0.074**	0.084**
	sig. (2-tailed)	*.000*	*.000*
	Physical Activity	-0.165**	-0.120**
	sig. (2-tailed)	*.000*	*.000*

6.1.2.2 MENTAL HEALTH

Starting with One-Way ANOVA tests, it was found that the cohort in which the respondent filled in the survey, the gender of the respondent and the workload they experience since working from home, are associated with the mental health of teleworkers (Table 26).

Men were found to experience better mental health compared to women and people of non-binary genders. Men experience less job stress and exhaustion and fewer depressive symptoms, while also experiencing better work-life balance than women and people of non-binary genders. It is also found that respondents with a similar workload, since working from home, have significantly better mental health than those with increased or decreased workloads.

Table 26 One-Way ANOVA: Personal characteristics and Mental Health (N= 25058)

Independent Variable	Job Stress				Work-Life Balance (Brough et al. 2009)				# of Depression Symptoms			
	Mean	St. Dev	F	Sig.	Mean	St. Dev	F	Sig.	Mean	St. Dev	F	Sig.
Cohort			4.098	.017			9.645	.000			3.673	.025
Cohort 1	2.4374	.787			3.39	.932			0.55	.867		
Cohort 2	2.4731	.776			3.41	.924			0.59	.915		
Cohort 3	2.4720	.798			3.45	9.26			0.57	.904		
Gender			19.246	.000			29.148	.000			13.831	.000
Male	2.4370	.778			3.47	.903			0.54	.874		
Female	2.4886	.793			3.38	.945			0.59	.923		
Other	2.7127	.815			3.22	.955			0.69	.976		
Workload since WFH			1504.916	.000			490.483	.000			165.586	.000
Decreased	2.6656	.812			3.36	.941			0.86	1.0448		
Similar	2.2708	.699			3.55	.884			0.52	.861		
Increased	2.8441	.813			3.14	.953			0.57	.910		

Independent Variable	Exhaustion				Engagement (Schaufeli & Bakker, 2003)			
	Mean	St. Dev	F	Sig.	Mean	St. Dev	F	Sig.
Cohort			19.274	.000			93.944	.000
Cohort 1	2.4542	.730			3.7709	.611		
Cohort 2	2.5273	.765			3.7015	.641		
Cohort 3	2.4783	.750			3.8226	.615		
Gender			46.704	.000			8.862	.000
Male	2.4478	.740			3.7503	.626		
Female	2.5316	.761			3.7752	.627		
Other	2.7691	.783			3.6011	.721		
Workload since WFH			518.612	.000			343.819	.000
Decreased	2.4606	.764			3.4832	.703		
Similar	2.3938	.722			3.7686	.612		
Increased	2.7392	.763			3.8570	.599		

Independent t-tests on the relationship between job role and mental health revealed that job role is significantly related to the mental health of teleworkers (Table 27). Teleworkers with managerial roles experienced more job stress, exhaustion and engagement than those with non-managerial roles. Conversely, managers also experience poorer work-life balance and fewer depression symptoms.

Table 27 Independent t-test: Job Role and Mental Health (N= 25058)

Independent Variable	Job Stress			Work-life Balance			# of Depression Symptoms		
	Mean	t-value	Sig.	Mean	t-value	Sig.	Mean	t-value	Sig.
Job Role		4.765	.000		-7.737	.000		-7.571	.000
Managerial role	2.5524			3.26			0.41		
Non-managerial role	2.4589			3.34			0.58		

Independent Variable	Exhaustion			Engagement		
	Mean	t-value	Sig.	Mean	t-value	Sig.
Job Role		4.818	.000		10.067	.000
Managerial role	2.5575			3.9091		
Non-managerial role	2.4871			3.7519		

Spearman and Pearson correlation tests revealed significant relationships between age, education level, sedentary behaviour, physical activity and mental health (Table 28). Age was found to be weakly related to job stress, symptoms of depression, exhaustion and the work-life balance of teleworkers. Education is found to be positively related to job stress and exhaustion, as respondents with high education levels reported higher job stress and exhaustion. Conversely, high education levels were also found to be associated with poor work-life balance and depressive symptoms.

Respondents with poor sedentary behaviour were found to have higher stress and poorer work-life balance, compared to those with healthy sedentary behaviour (enough alteration between sitting and moving). Conversely, poor sedentary behaviour was found to be related to fewer symptoms of

depression. Physical activity was found to be negatively related to job stress, depression and exhaustion, and work-life balance and engagement were found to be significantly better among teleworkers that were physically active.

Table 28 Spearman and Pearson correlation tests: Personal characteristics and Mental Health (N= 25058)

		Dependent Variable				
	Independent Variable	Job Stress	Work-Life Balance	# of Depression Symptoms	Exhaustion	Engagement
Spearman	Age	-.090**	.142**	-.195**	-.162**	.000
	sig. (2-tailed)	*.000*	*.000*	*.000*	*.000*	*.937*
	Education level	.174**	-.180**	-.132**	.162**	.001
	sig. (2-tailed)	*.000*	*.000*	*.000*	*.000*	*.932*

		Dependent Variable				
	Independent Variable	Job Stress	Work-Life Balance	# of Depression Symptoms	Exhaustion	Engagement
Pearson	Sedentary Behaviour	0.123**	-0.142**	-0.113**	0.153**	-0.057**
	sig. (2-tailed)	*.000*	*.000*	*.000*	*.000*	.000
	Physical Activity	-0.174**	0.229**	-0.127**	-0.226**	0.053**
	sig. (2-tailed)	*.000*	*.000*	*.000*	*.000*	*.000*

8.1.2.3 SOCIAL HEALTH

Starting with One-Way ANOVA tests, it was found that the cohort in which the respondent filled in the survey, the gender of the respondent and the workload they experience since working from home, is associated with the social health of teleworkers (Table 29). Respondents in cohorts 2 and 3 were found to suffer from significantly higher social isolation than those in cohort 1. Also, males experienced significantly lower professional isolation than females and persons with non-binary genders. Similar to the relationship between and physical health and mental health, it was found that respondents with a similar workload experience significantly lower professional isolation than those with increased or decreased workloads. Persons with decreased workloads were found to experience the most professional isolation.

Table 29 One-Way ANOVA: Personal characteristics and Social Health (N= 25058)

Independent Variable	Professional Isolation (Golden et al. 2008)			
	Mean	St. Dev	F	Sig.
Cohort			7.145	.001
Cohort 1	3.1179	.714		
Cohort 2	3.1615	.760		
Cohort 3	3.1625	.746		
Gender			35.271	.000
Male	3.1112	.72979		
Female	3.1898	.75746		
Other	3.2275	.77809		
Workload since WFH			247.057	.000
Decreased	3.4442	.718		
Similar	3.0981	.739		
Increased	3.1689	.745		

The job role of teleworkers was found to be related to professional isolation, in which managers experienced significantly lower professional isolation than those with non-managerial roles - possibly due to the nature of their work being more social (Table 30).

Table 30 Independent t-test: Personal characteristics and Social Health (N= 25058)

Independent Variable	Professional Isolation		
	Mean	t-value	Sig.
Job Role		-4.561	.000
Managerial role	3.0740		
Non-managerial role	3.1588		

Spearman and Pearson correlation tests revealed significant relationships between age, education level, sedentary behaviour, physical activity and professional isolation (Table 31). Age was found to be negatively related to professional isolation, as older respondents reported feeling less isolated. Conversely, highly-educated teleworkers were found to be significantly more professionally isolated compared to teleworkers with lower educational attainment. Poor sedentary behaviour was found to associated with high professional isolation, while regular physical activity was found to be associated with lower professional isolation.

Table 31 Spearman and Pearson correlation tests: Personal characteristics and Social Health (N= 25058)

	Independent Variable	Dependent Variable Professional Isolation
Spearman	Age	-.113**
	sig. (2-tailed)	*.000*
	Education level	.103**
	sig. (2-tailed)	*.000*

	Independent Variable	Dependent Variable Professional Isolation
Pearson	Sedentary Behaviour	.116**
	sig. (2-tailed)	*.000*
	Physical Activity	-.136**
	sig. (2-tailed)	*.000*

6.1.3 RELATIONSHIPS BETWEEN PERSONAL CHARACTERISTICS AND PERCEIVED PRODUCTIVITY

All personal characteristics in the model were found to be significantly related to perceived productivity. Starting with One-Way ANOVA tests, it was found that the cohort in which the respondent filled in the survey, the gender of the respondent and the workload they experience since working from home, have significant relationships with the perceived productivity (Table 32). Perceived productivity was found to be related to gender, in which women reported higher perceived productivity compared to men and respondents with non-binary genders. Respondents with decreased workloads since working from home were found to report significantly lower productivity compared to respondents with similar or increased workloads.

Table 32 One-Way ANOVA: Personal Characteristics and perceived Productivity (N= 25058)

Independent Variable	Perceived Productivity			
	Mean	St. Dev	F	Sig.
Cohort			146.005	.000
Cohort 1	7.42	1.266		
Cohort 2	7.53	1.255		
Cohort 3	7.75	1.127		
Gender			68.840	.000
Male	7.50	1.255		
Female	7.68	1.174		
Other	7.44	1.258		
Workload since WFH			1394.363	.000
Decreased	6.50	1.541		
Similar	7.64	1.117		
Increased	7.89	1.060		

Independent t-tests on the relationship between job role and perceived productivity revealed that teleworkers with managerial roles perceived themselves to be significantly more productive than non-managerial teleworkers (Table 33).

Table 33 Independent t-test: Personal characteristics and perceived Productivity (N= 25058)

Independent Variable	Perceived Productivity		
	Mean	t-value	Sig.
Job Role		4.438	.000
Managerial role	7.72		
Non-managerial role	7.58		

Spearman and Pearson correlation tests revealed significant relationships between age, education level, sedentary behaviour, physical activity and professional isolation (Table 34). Age was found to be positively related to perceived productivity, as older teleworkers reported significantly higher perceived productivity compared to younger teleworkers in the sample. Conversely, education was found to be negatively related to perceived productivity, as highly-educated respondents reported lower perceived productivity compared to those with lower educational attainment. Furthermore, poor sedentary behaviour was found to be associated with lower perceived productivity, while physical activity was positively related to perceived productivity.

Table 34 Spearman and Pearson correlation tests: Personal characteristics and perceived Productivity (N= 25058)

		Dependent Variable
	Independent Variable	Perceived Productivity
Spearman	Age	0.099**
	sig. (2-tailed)	*.000*
	Education level	-0.110**
	sig. (2-tailed)	*.000*
Pearson	Sedentary Behaviour	-0.058**
	sig. (2-tailed)	*.000*
	Physical Activity	0.061**
	sig. (2-tailed)	*.000*

** Significant at the 0.01 level (2-tailed)

* Significant at the 0.05 level (2-tailed)

6.2 ENVIRONMENTAL CHARACTERISTICS

In this section, the bivariate analyses that were conducted to investigate the relationships between environmental characteristics and various dependent variables, such as health and productivity, are discussed. The environmental characteristics that are included in this study are the types of at-home workspace: *1) furnished workspace (dichotomous), 2) enclosed workspace (dichotomous),* household factors: *3) partner (dichotomous), 4) children (dichotomous), 5) living with others (dichotomous), and support: 6) perceived organisational support.*

6.2.1 RELATIONSHIPS BETWEEN ENVIRONMENTAL CHARACTERISTICS AND HEALTH

To investigate the relationships between environmental characteristics and health, two types of bivariate analyses were conducted: Independent t-tests and Pearson's correlation tests. The health aspects that are analysed are physical health problems (ratio-scale musculoskeletal problems and SBS symptoms), mental health aspects such as job stress and symptoms of depression (interval and ratio-scale), as well as the social health aspect of professional isolation (interval-scale).

7.2.1.1 PHYSICAL HEALTH

Independent t-tests revealed significant differences in physical health aspects related to the at-home workspace and household factors (Table 35). Teleworkers in furnished and enclosed workspaces were found to have fewer physical health problems, compared to those working in non-furnished and non-enclosed workspaces at home. Moreover, it was found that respondents that lived alone (without partners, roommates or parents) experienced more musculoskeletal problems and SBS symptoms than those living with others.

Table 35 Independent t-test: Environmental characteristics and Physical Health (N= 25058)

	Independent Variable	# of Musculoskeletal Problems			# of SBS Symptoms		
		Mean	t-value	Sig.	Mean	t-value	Sig.
At-home Workspace	Furnished Workspace		-13.218	.000		-7.677	.000
	Furnished Workspace	0.90			0.33		
	Not Furnished	1.08			0.39		
	Enclosed Workspace		-9.240	.000		-5.577	.000
	Enclosed Workspace	0.93			0.34		
	Not Enclosed	1.06			0.38		
Household Factors	Partner		-5.579	.000		-5.679	.000
	Living with Partner	0.96			0.34		
	No partner	1.04			0.39		
	Children		0.727	.467		-1.526	.127
	Living with Children	0.98			0.35		
	No children	0.97			0.36		
	Living with others		-2.463	.014		-4.605	.000
	Living with others	0.97			0.35		
	Living alone	1.01			0.40		

Pearson correlation tests revealed that respondents with low perceived organisational support experience significantly more musculoskeletal problems and SBS symptoms (Table 36).

Table 36 Pearson correlation test: Environmental characteristics and Physical Health (N= 25058)

Independent Variable	Dependent Variable	
	# of Musculoskeletal Problems	# of SBS Symptoms
Perceived organisational Support	-.161**	-.122**
sig. (2-tailed)	*.000*	*.000*

7.2.1.2 MENTAL HEALTH

Independent t-tests revealed significant differences in mental health aspects related to the at-home workspace and household factors (Table 37).

Table 37 Independent t-test: Environmental characteristics and Mental Health (N= 25058)

	Independent Variable	Job Stress			Work-life Balance			# of Depression Symptoms		
		Mean	t-value	Sig.	Mean	t-value	Sig.	Mean	t-value	Sig.
At-home Workspace	Furnished Workspace		-6.962	.000		17.613	.000		-9.974	.000
	Furnished Workspace	2.4370			3.51			0.52		
	Not Furnished	2.5075			3.30			0.64		
	Enclosed Workspace		-6.067	.000		15.254	.000		-4.933	.000
	Enclosed Workspace	2.4436			3.49			0.55		
	Not Enclosed	2.5070			3.30			0.61		
Household Factors	Partner		-2.135	.033		6.628	.000		-15.490	.000
	Living with Partner	2.4594			3.44			0.52		
	No partner	2.4842			3.35			0.72		
	Children		8.089	.000		-12.696	.000		-3.807	.000
	Living with Children	2.5096			3.34			0.54		
	No children	2.4289			3.49			0.59		
	Living with others		-1.642	.101		4.848	.000		-14.383	.000
	Living with others	2.4619			3.43			0.53		
	Living alone	2.4844			3.36			0.76		

	Independent Variable	Exhaustion			Engagement		
		Mean	t-value	Sig.	Mean	t-value	Sig.
At-home Workspace	Furnished Workspace		-11.540	.000		12.932	.000
	Furnished Workspace	2.4483			3.8046		
	Not Furnished	2.5600			3.7005		
	Enclosed Workspace		-8.314	.000		6.280	.000
	Enclosed Workspace	2.4647			3.7807		
	Not Enclosed	2.5479			3.7283		
Household Factors	Partner		-8.761	.000		5.838	.000
	Living with Partner	2.4699			3.7757		
	No partner	2.5672			3.7216		
	Children		2.835	.005		6.404	.000
	Living with Children	2.5081			3.7906		
	No children	2.4811			3.7397		
	Living with others		-7.039	.000		8.346	.000
	Living with others	2.4790			3.7768		
	Living alone	2.5713			3.6856		

Working from a furnished and enclosed workspace was found to be associated with low job stress, better work-life balance, fewer depressive symptoms, low exhaustion and high engagement. Having a partner was found to be related to experiencing lower job stress, better work-life balance, fewer depressive symptoms, low exhaustion and high engagement. Conversely, having children was found to be associated with high job stress and poor work-life balance. Living alone was found to be related to poor work-life balance (possibly related to overwork), increased risk of depressive symptoms, higher exhaustion and lower engagement.

Pearson correlation tests reveal the relationship between perceived organisational support and mental health (Table 38). High perceived organisational support was related to a decrease in job stress, risk of depression and exhaustion. Conversely, high perceived organisational support was also found to be related to improved work-life balance and increased engagement.

Table 38 Pearson correlation test: Environmental characteristics and Mental Health (N= 25058)

	Dependent Variable				
Independent Variable	Job Stress	Work-Life Balance	# of Depression Symptoms	Exhaustion	Engagement
Perceived organisational Support	-.264**	.277**	-.182**	-.281**	.271**
sig. (2-tailed)	*.000*	*.000*	*.000*	*.000*	*.000*

7.2.1.3 SOCIAL HEALTH

Independent t-tests revealed significant differences in social health (professional isolation) related to the at-home workspace and household factors (Table 39). Working from furnished and enclosed workspaces was found to be associated with low professional isolation. Similarly, having no partner, having children and living alone were found to be related to high professional isolation.

Table 39 Independent t-test: Environmental characteristics and Social Health (N= 25058)

		Professional Isolation		
	Independent Variable	Mean	t-value	Sig.
At-home Workspace	Furnished Workspace		-10.737	.000
	Furnished Workspace	3.1116		
	Not Furnished	3.2144		
	Enclosed Workspace		-7.862	.000
	Enclosed Workspace	3.1262		
	Not Enclosed	3.2041		
Household Factors	Partner		-8.007	.000
	Living with Partner	3.1318		
	No partner	3.2199		
	Children		2.967	.003
	Living with Children	3.1684		
	No children	3.1403		
	Living with others		-7.351	.000
	Living with others	3.1382		
	Living alone	3.2337		

Pearson correlation tests revealed the relationship of perceived organisational support on mental health (Table 40). Perceived organisational support was found to be related to professional isolation as high perceived organisational support is associated with reduced feelings of professional isolation.

Table 40 Pearson correlation test: Environmental characteristics and Social Health (N= 25058)

	Dependent Variable
Independent Variable	Professional Isolation
Perceived organisational Support	-.211**
sig. (2-tailed)	*.000*

6.2.2 RELATIONSHIPS BETWEEN ENVIRONMENTAL CHARACTERISTICS AND PERCEIVED PRODUCTIVITY

Independent t-tests revealed significant differences in perceived productivity related to the at-home workspace and household factors (Table 41).

Table 41 Independent t-test: Environmental characteristics and perceived Productivity (N= 25058)

Independent Variable		Self-perceived Productivity		
		Mean	t-value	Sig.
At-home Workspace	Furnished Workspace		12.449	.000
	Furnished Workspace	7.67		
	Not Furnished	7.48		
	Enclosed Workspace		9.745	.000
	Enclosed Workspace	7.65		
	Not Enclosed	7.49		
Household Factors	Partner		6.921	.000
	Living with Partner	7.62		
	No partner	7.50		
	Children		-3.821	.000
	Living with Children	7.56		
	No children	7.62		
	Living with others		6.699	.000
	Living with others	7.61		
	Living alone	7.47		

Teleworkers in furnished and enclosed workspaces were found to perceive themselves as more productive, compared to those in non-furnished and non-enclosed workspaces. Respondents that lived with a partner perceived themselves to be more productive compared to those without a partner. Conversely, respondents with children in the household were found to report reduced perceived productivity. Living alone was related to reduced perceived productivity compared to when living with others.

Pearson correlation tests revealed the relationship between perceived organisational support and perceived productivity (Table 42). Perceived organisational support was found to be positively related to perceived productivity. Therefore, high perceived organisational support was related to higher perceived productivity.

Table 42 Pearson correlation tests: Environmental characteristics and perceived Productivity (N= 25058)

Independent Variable	Dependent Variable Perceived Productivity
Perceived organisational Support	.157**
sig. (2-tailed)	*.000*

6.2.3 RELATIONSHIPS BETWEEN ENVIRONMENTAL CHARACTERISTICS

Using Chi-Square tests and independent t-tests significant relationships between environmental characteristics were identified (Table 43 and Table 44). Respondents who reported working from furnished workspaces were significantly more likely to also work from an enclosed workspace. Living with others was found to be associated with working from a non-enclosed workspace. 61.3% of respondents that lived with others worked from an enclosed workspace, while 89.2% of respondents that lived alone worked from an enclosed workspace.

Also, significant relationships were found between the at-home workspace, household factors and perceived organisational support, however, all significant relationships were found to be very weak.

Table 43 Chi-Square tests: Inter-environmental relationships (N= 25058)

Independent Variable	df	Furnished Workspace		Enclosed Workspace		Partner (no/yes)		Children (no/yes)		Living w/ Others (no/yes)	
		χ2	Sig.	χ2	Sig.	χ2	Sig.	χ2	Sig.	χ2	Sig.
Furnished Workspace	1	-	-								
Enclosed Workspace	1	2459.850**	.000	-	-						
Partner	1	367.117**	.000	412.551**	.000	-	-				
Children	1	.818	.366	649.026**	.000	1314.230**	.000	-	-		
Living with Others	1	244.662**	.000	1132.362**	.000	14516.369**	.000	3784.865**	.000	-	-

Overall, respondents in furnished or enclosed workspaces were found to perceived slightly higher organisational support from their organisation and manager(s). Furthermore, respondents without partners, children or those living alone were found to perceive lower organisational support.

Table 44 Independent t-tests: Inter-environmental relationships (N= 25058)

		Perceived Organisational Support		
	Independent Variable	Mean	t-value	Sig.
At-home Workspace	Furnished Workspace		8.929	.000
	Furnished Workspace	3.2826		
	Not Furnished	3.1939		
	Enclosed Workspace		5.062	.000
	Enclosed Workspace	3.2648		
	Not Enclosed	3.2128		
Household Factors	Partner		1.786	.074
	Living with Partner	3.2518		
	No partner	3.2314		
	Children		5.199	.000
	Living with Children	3.2749		
	No children	3.2239		
	Living with others		3.648	.000
	Living with others	3.2545		
	Living alone	3.2054		

6.3 HEALTH

In this section, the bivariate analyses that were conducted to investigate the relationships between health aspects and perceived productivity are discussed. The health aspects that were included in this study are physical health aspects: *1) the number of musculoskeletal problems one suffers from, 2) the number of SBS Symptoms one suffers from,* mental health aspects*: 3) job stress, 4) work-life balance, 5) the number of depression symptoms one suffers from, 6) exhaustion, 7) engagement,* and social health: *8) professional isolation.*

6.3.1 RELATIONSHIPS BETWEEN HEALTH AND PERCEIVED PRODUCTIVITY

Through Pearson correlation tests, the bivariate relationships between health aspects and perceived productivity were identified.

All physical, mental and social health aspects were found to be significantly related to perceived productivity (Table 45). Poor physical health was found to be associated with reduced perceived productivity, as respondents who experienced musculoskeletal problems and SBS problems reported lower productivity compared to those without physical health problems.

Table 45 Pearson correlation test: Health and perceived Productivity (N= 25058)

	Independent Variable		Dependent Variable Self-Perceived Productivity
Physical Health	# of Musculoskeletal Problems		-.114**
		sign.	.000
	# of SBS Symptoms		-.121**
		sign.	.000
Mental Health	Job Stress		-.262**
	(Shukla & Srivastava, 2016)	*sign.*	*.000*
	Work-Life Balance		.339**
	(Brough et al, 2009)	*sign.*	*.000*
	# of Depression Symptoms		*-.416***
		sign.	*.000*
	Exhaustion		-.324**
		sign.	*.000*
	Engagement Score		.402**
	(Schaufeli & Bakker, 2003)	*sign.*	*.000*
Social Health	Professional Isolation		-.392**
	(Golden et al. 2008)	*sign.*	*.000*

** Significant at the 0.01 level (2-tailed)

* Significant at the 0.05 level (2-tailed)

Poor mental health was also found to be negatively related to low perceived productivity. High job stress, exhaustion and experiencing depressive symptoms were found to be related to low perceived productivity. Conversely, high work-life balance and engagement were found to be associated with high perceived productivity. Professional isolation is found to be negatively related to perceived productivity, as respondents with high incidences of professional isolation reported lower perceived productivity.

6.3.2 RELATIONSHIPS BETWEEN HEALTH ASPECTS

It was found that the different health aspects were significantly related (Table 46). A weak positive relationship was found between the number of musculoskeletal problems and the number of SBS symptoms one suffered from. Physical health problems were also found to be significantly related to exhaustion.

Job stress was found to be related to other mental health aspects, as high job stress was found to be associated with high exhaustion, experiencing depressive symptoms, reduced engagement and work-life balance. Exhaustion was found to be related to job stress and work-life balance, in which high exhaustion was associated with high job stress and low work-life balance. Professional isolation was found to be positively related to job stress, depressive symptoms and exhaustion.

Table 46 Pearson correlation tests: Relationships between health aspects (N= 25058)

		Physical Health		Mental Health					Social Health
		1	2	3	4	5	6	7	8
Physical Health	1 # of Musculoskeletal problems	1							
	2 # of SBS Symptoms	.330**	1						
Mental Health	3 Job Stress	.225**	.232**	1					
	4 Work-Life Balance	-.254**	-.245**	-.525**	1				
	5 # of Depression Symptoms	.228**	.267**	.344**	-.390**	1			
	6 Exhaustion	.304**	.315**	.619**	-.672**	.464**	1		
	7 Engagement	-.106**	-.103**	-.189**	.204**	-.295**	-.289**	1	
Social Health	8 Professional Isolation	.231**	.211**	.367**	-.422**	.403**	.434**	-.164**	1

**. Correlation is significant at the 0.01 level (2-tailed).

6.4 EFFECT SIZES

The bivariate analysis provided insights regarding the statistical significance of the relationships in the model. However, the use of *p*-values alone does not represent the magnitude and importance of the obtained results (Tomczak, 2014). Furthermore, as each different bivariate analysis method presents its respective indicator of strength (i.e. chi-square value, t-value, F-value, correlation coefficient) it is difficult to interpret the differences in strength or magnitude of the bivariate relationships. Therefore, the results from the bivariate analyses were further analysed through effect size estimates.

Estimates of effect sizes allow the assessment of the strength of the relationship between the investigated variables (Durlak, 2009; Tomczak, 2014). Effect sizes were computed following the formulas presented in Tomczak's (2014) research, which discusses the importance of effect size for the evaluation of the importance of relationships.

The relationships presented in Table 47 represent the magnitude of the various relationships in the model, in which coloured effect size estimates represent stronger relationships as described in the legend. First, several relatively weak relationships were identified between the personal and environmental characteristics. Furthermore, weak relationships were found between personal characteristics and health, as well as environmental characteristics and health, except for perceived organisational support and aspects of health. Moderate to strong relationships were identified between health aspects and between aspects of health and perceived productivity.

Following the effect size estimates in Table 47, it is expected that various weak relationships in the model will become insignificant when controlling for other variables in the model, while the stronger relationships remain statistically significant.

6.5 CONCLUSION

This chapter aimed to analyse the relationships between two variables, the significance of these relationships, and to provide input for the path analysis which is conducted in Chapter 7. Bivariate analysis revealed many statistically significant relationships between personal characteristics, environmental characteristics, health and perceived productivity. For example, women and highly-educated respondents reported poorer physical health and higher job stress and exhaustion compared to men and those with lower educational attainment. Furthermore, it was found that respondents working from furnished and/or enclosed workspaces reported significantly higher productivity and better physical and mental health compared to those working from non-furnished and non-enclosed workspaces.

The effect sizes presented in Table 47 revealed that many of the revealed relationships were relatively weak. Moreover, it was found that personal and environmental characteristics were significantly related to health and productivity, however, the relationship was found to be relatively weak. The relationships between aspects of health and productivity were found to be very strong. These findings suggest that physical, mental and social health plays an especially large role in the perceived productivity of teleworkers, while personal and environmental factors only play a relatively small role.

Table 47 Effect Sizes overview

		Personal Characteristics								Environmental Characteristics						Health								
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
Personal Characteristics	1 Cohort	1																						
	2 Gender	0.16**	1																					
	3 Age	0.08**	0.24**	1																				
	4 Job Role	0.03**	0.06**	0.09**	1																			
	5 Education level	0.13**	0.11**	0.29**	0.13**	1																		
	6 Sedentary Behaviour	0.00*	0.00**	-0.09**	-	0.18**	1																	
	7 Physical Activity	0.01**	0.01**	0.06**	-	0.02**	-0.14**	1																
	8 Workload since WFH	0.11**	0.05**	0.07**	0.13**	0.13**	0.01**	0.01**	1															
Environmental Characteristics	9 Furnished Workspace	0.05**	0.04**	0.05**	-	0.08**	0.03**	0.03**	0.06**	1														
	10 Enclosed Workspace	0.05**	0.07**	0.06**	0.02**	0.08**	0.04**	0.04**	0.06**	0.31**	1													
	11 Partner	0.03**	0.09**	0.14**	0.05**	-	-	-	-	0.12**	0.13**	1												
	12 Children	0.02**	0.02**	0.38**	0.04**	0.06**	-	0.05**	0.02**	-	0.16**	0.23**	1											
	13 Living with Others	-	0.04**	0.08**	0.05**	-	-	0.02**	0.02*	0.10**	0.21**	0.76**	0.39**	1										
	14 Perceived Organisational Support	0.00**	0.00**	-0.03**	-	-0.07**	-0.10**	0.10**	0.00**	0.06**	0.03**	-	0.03**	0.02**	1									
Health	15 # of Muskuloskeletal Problems	0.00**	0.02**	-0.12**	-	0.05**	0.07**	-0.17**	0.00**	0.08**	0.06**	0.08**	-	0.02*	-0.16**	1								
	16 # of SBS Symptoms	0.00**	0.01**	-0.13**	-	0.08**	0.08**	-0.12**	0.00**	0.05**	0.04**	0.04**	-	0.03**	-0.12**	0.33**	1							
	17 Job Stress	0.01**	0.00**	-0.09**	0.03**	0.17**	0.12**	-0.17**	0.33**	0.04**	0.04**	0.01*	0.05**	-	-0.26**	0.23**	0.23**	1						
	18 Work-life Balance	0.00**	0.00**	0.14**	0.05**	-0.18**	-0.14**	0.23**	0.02**	0.11**	0.10**	0.04**	0.08**	0.03**	0.28**	-0.25**	-0.25**	-0.53**	1					
	19 # of Depression Symptoms	0.00*	0.00**	-0.20**	0.05**	-0.16**	-0.11**	-0.13**	0.00**	0.06**	0.03**	0.10**	0.02**	0.09**	-0.18**	0.23**	0.27**	0.34**	-0.39**	1				
	20 Exhaustion	-	0.00**	-0.16**	0.03**	0.16**	0.15**	-0.23**	0.03**	0.07**	0.05**	0.05**	0.02**	0.04**	-0.28**	0.30**	0.32**	0.62**	-0.67**	0.47**	1			
	21 Engagement Score	0.00**	0.00**	-	0.06**	-	-0.06**	0.05**	0.02**	0.08**	0.04**	0.04**	0.04**	0.05**	0.27**	-0.11**	-0.10**	-0.19**	0.20**	-0.30**	-0.29**	1		
	22 Professional Isolation	0.00**	0.01**	-0.11**	0.03**	0.10**	0.12**	-0.14**	0.01**	0.07**	0.05**	0.05**	0.02**	0.05**	-0.21**	0.23**	0.21**	0.37**	-0.42**	0.40**	0.43**	-0.16**	1	
	23 Self-Perceived Productivity	0.01**	0.01**	0.10**	0.03**	-0.11**	-0.06**	0.06**	0.08**	0.08**	0.06**	0.04**	0.02**	0.04**	0.10**	-0.11**	-0.12**	-0.26**	0.34**	-0.42**	-0.32**	0.40**	-0.39**	1

** Significant at the 0.01 level (2-tailed)

* Significant at the 0.05 level (2-tailed)

LEGEND	
≤ .19	*Negligible correlation; almost no relationship*
.20 - .39	*Low correlation; definite but small relationship*
.40 - .69	*Moderate correlation; substantial relationship*
.70 - .89	*High correlation; strong relationship*
.90 – 1.00	*Very high correlation; very dependable relationship*

CHAPTER 7

PATH ANALYSIS

Photo by Nataliya Vaitkevich from Pexels

CHAPTER 7: PATH ANALYSIS

The previous chapter discussed the various relationships between variables, the significance of these relationships, and provided input for the path analysis. This chapter aims to identify the significant relationships in the path model, and discuss the direct and indirect relationships of personal and environmental characteristics with health aspects and perceived productivity. Furthermore, mediation analysis and explanatory analysis is performed to provide possible explanations of the relationships in the path model.

First, the operationalization of the path model is discussed. Second, the significant relationships between personal and environmental characteristics and health and perceived productivity are discussed. Third, the significant relationships between aspects of health and perceived productivity are discussed. Fourth, the mediating role of health is discussed in the relationships between personal and environmental characteristics and perceived productivity. Last, possible explanations of the identified relationships in the path model are discussed, based on the findings in descriptive analyses of week 7's dataset.

7.1 OPERATIONALIZATION

The path model is estimated using the statistical package LISREL version 8.54. For LISREL to function properly, categorical variables were recoded into dummy variables. Continuous variables were kept identical to the variables used in the bivariate analyses and descriptive analyses for week 3 data.

Two slight alterations were made to the dataset:

1) Persons that identify as neither male nor female (118 respondents) were removed from the path analysis data-set as this category was not suitable for path analysis, due to being such a small proportion of the sample. Similarly, persons that stated having 'other' education (189 respondents) were also excluded from the dataset for the same reason. This results in a new research sample of 24,751 respondents for the path analysis;
2) Education was recoded into 3 new dummy variables: low (*Primary and Secondary education + MBO)*, middle (*HBO*) and high (*university*) education levels in order to have equal group sizes. This division of the Dutch education system is different to the division which is normally used (low= Primary education, VMBO, the first three years of HAVO/VWO or MBO-1; medium= *Senior secondary education (HAVO/VWO), and MBO-2 through MBO-4; high= Higher professional education (HBO) or university)* (CBS, 2019).

7.2 PATH ANALYSIS

As discussed in the introduction of this chapter, all significant relationships that were observed in the bivariate analyses were added to the path model. The model was then optimized, in which the relationships that were found to not be significant at the 0.05 significance level were removed from the path model. The risk of overfitting the model was reduced by reducing the number of variables in the model and removing insignificant relationships ($t \leq 1.96$). This step-by-step process was repeated until an acceptable model fit was found and all insignificant relationships were removed from the model. As a result, the following six variables were removed from the path model for being insignificantly related to aspects of health or perceived productivity:

- *Cohort;*
- *Job Role;*
- *Sedentary behaviour;*
- *Physical activity;*
- *Workload since WFH;*
- *Partner.*

Preferably, categorical environmental characteristics such as the at-home workplace and household factors would have been analysed on their relation with personal characteristics as well. However, according to Finney and DiStefano (2006), Structural Equation Modelling (SEM) did not allow the use of dummy variables when these variables are endogenous (i.e. having no incoming arrows). Meaning that dummy variables (such as the at-home workplace and household factors) are only allowed when exogeneous. Therefore, the relationship between personal characteristics and the at-home workplace and household factors were not included in the path model.

Table 48 shows the information regarding the goodness of fit of the final path model, which is presented in Figure 15. As the path model is quite complex, the model was broken down into simplified versions as can be seen in Figures 16 through 20.

Table 48 Goodness of Fit information

Full Information ML Chi-Square	140.81 (p= 0.000)
Degrees of Freedom (df)	29
Goodness of Fit Index	1.000
Comparative Fit Index (CFI)	1.000
RMSEA (Root Mean Square Error of Approximation)	0.012
90% Confidence interval for RMSEA	0.010; 0.015
p-value for Test of Close Fit (RMSEA < 0.05)	1.000
Root Mean Square Residual (RMR)	0.0033
Chi-Square/df	4.856

The path model was found to have an acceptable fit when it meets the following four requirements:

- ✓ The Goodness-of-Fit Index (GFI) is a measure ranging from 0 (poor fit) to 1.0 (perfect fit), which measures the degree to which the actual input matrix is predicted by the estimated model (Zhang, 2000). The Goodness of Fit Index should be larger than 0.90 to indicate a good model (Byrne, 1998; de Jong, 1999). In this model, the Goodness of Fit index is 1, which can be considered a perfect fit.
- ✓ The Comparative Fit Index (CFI), which is related to the Goodness of Fit Index, should be larger than 0.90 to indicate a good fit, and values less than .90 indicate a poor fit (Schumacker & Lomax, 2010). Several benchmarks are accepted as some scholars suggest a benchmark of .90 (e.g., Schumacker & Lomax, 2010) while others may suggest a stricter benchmark of .95 (e.g., Hu & Bentler, 1999). In this model, the Comparative Fit Index is 1, which can be considered a very good fit.
- ✓ The Root Mean Square Error of Approximation (RMSEA) takes into account the error of approximation in the population. It is commonly considered that values less than 0.05 indicate a good fit; values from 0.05 to 0.08 represent a fair fit; values ranging from 0.08 to 0.10 indicate a poor fit; and those greater than 0.10 indicate a very poor fit (Byrne, 1998; de Jong, 1999). In this model, the RMSEA is found to be 0.012 – which was found to be a (very) good fit.
- ✓ The Root Mean Square Residual (RMR) (which is the square root of the mean of the squared residuals – an average of the residuals between observed and estimated input matrices) represents the average value across all standardized residuals and ranges from 0 to 1.00. According to Byrne (1998), the model is considered well-fitted when this value is smaller than 0.05 which was the case for this path model (RMR= 0.0033).

Normally, the significance of the Chi-Square statistic is considered to be another requirement of acceptable path model fit. The likelihood-ratio Chi-square statistic, which is the only statistically based measure of goodness-of-fit available in a structural equation model (Zhang, 2000), is found to be acceptable when the *p*-value is larger than .05 and thus is insignificant (Schumacker & Lomax, 2010).

When insignificant, the Chi-Square statistic states that the difference between observed and expected variance is not due to variation in the sample.

In this model, however, a significant Chi-Square *p*-value of .000 was identified, therefore indicating that the model does not have an acceptable fit. Zhang (2000) discusses an important criticism of the Chi-square measure, as this measure is too sensitive to sample size differences, especially in cases where the sample size is larger than 200 respondents, which was the case for the current research: *"As sample size increases, this [Chi Square p-value] measure has a greater tendency to indicate significant differences for equivalent models. Moreover, when the sample size nears 100 or goes even lower, the Chi-square test will show acceptable fit even when none of the model relationships are shown to be different"* (pp. 102–103). Thus, meaning that the larger the sample size, the greater the chances of obtaining a statistically significant Chi-Square statistic in par. Therefore, alternative measures of fit have been developed, one of which uses the Chi-Square divided by the degrees of freedom (χ2/df) as a measure of model fit. This ratio should ideally be smaller than 2, while smaller than 5 is also acceptable (Stassart et al., 2013). In this model, the Chi-Square statistic was 4.856 times larger than the degrees of freedom – which was just within the acceptable range.

The full path model with only the significant relationships is presented (Figure 15). Positive relationships were presented through black arrows, while negative relationships are presented through dashed red arrows. In Table 49, the unstandardized (B) and standardized coefficients (*β*) of all the significant relationships in the model are presented. All the relationships in this table are significant at the .01 level (2-tailed), except for the relationships between the enclosed workspace and exhaustion which is significant at the .05 level.

The colours in Table 49 represents whether the relationship is positive (green) or negative (red), in which brighter coloured cells represent stronger the relationship between the two variables. (i.e. the relationship between exhaustion and job stress and the work-life balance are strong relationships compared to the relationship between exhaustion and perceived productivity).

Figure 15 Full path model

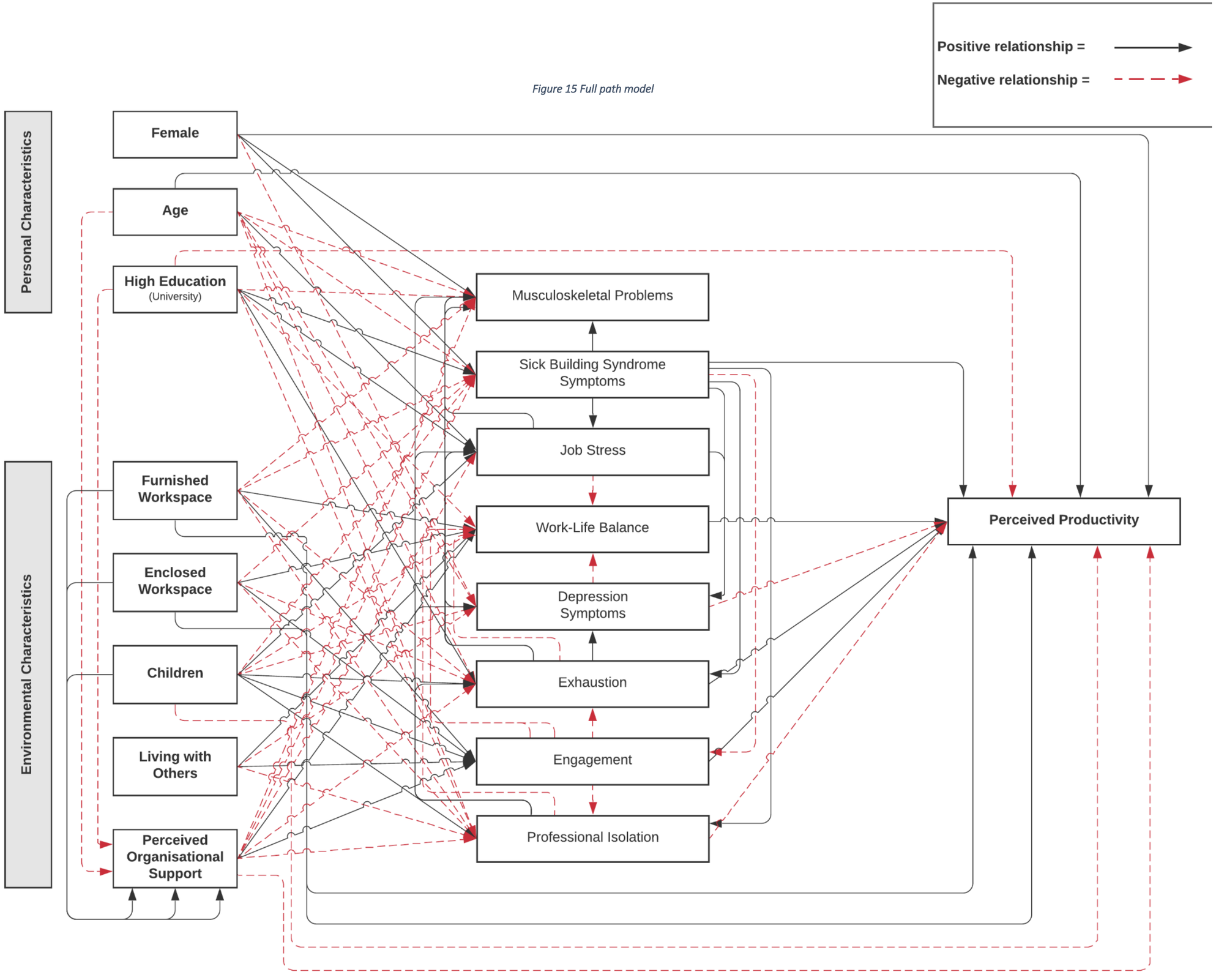


Table 49 Unstandardized (B) and Standardized coefficients (β) from Path Analysis

			Perceived Organisational Support	Musculoskeletal Problems	SBS Symptoms	*Job Stress*	*Work-life balance*	Depression Symptoms	Exhaustion	Engagement	Professional Isolation	Self-Perceived Productivity	Perceived Organisational Support	Musculoskeletal Problems	SBS Symptoms	*Job Stress*	*Work-life balance*	Depression Symptoms	Exhaustion	Engagement	Professional Isolation	Perceived Productivity
from	**Variables**	**Categories**	**Unstandardized coefficients (B)**										**Standardized coefficients (β)**									
Personal Characteristics	Gender	Male	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Female		0.18	0.09			-0.05				0.24		0.09	0.07			-0.03				0.10
	Age		-0.03	-0.03	-0.06	0.02		-0.09	-0.05		-0.05	0.03	-0.05	-0.03	-0.11	0.03		-0.12	-0.08		-0.08	0.03
	Education	Low	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		High	-0.14	-0.08	0.05	0.10	-0.11		0.13		0.09	-0.05	-0.09	-0.03	0.04	0.06	-0.06		0.08		0.06	-0.02
Environmental Characteristics	Furnished Workspace	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Yes	0.08	-0.09	-0.04		0.08		-0.02	0.07	-0.04	0.03	0.05	-0.04	-0.03		0.04		-0.02	0.05	-0.03	0.01
	Enclosed Workspace	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Yes	0.04		-0.02		0.08		-0.02	0.03	-0.05	0.05	0.03		-0.02		0.04		-0.01	0.02	-0.03	0.02
	Children	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Yes	0.06		-0.02	0.07	-0.13	-0.03	0.03	0.03	0.05	-0.05	0.04		-0.02	0.04	-0.07	-0.02	0.02	0.02	0.03	-0.02
	Living with others	No	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
		Yes					0.07	-0.12		0.06	-0.09						0.03	-0.05		0.04	-0.05	
	Perceived Organisational Support			-0.09	-0.09	-0.08	0.09		-0.14	0.21	-0.15	-0.09		-0.07	-0.12	-0.08	0.07		-0.14	0.26	-0.16	-0.05
Physical Health	Musculoskeletal Problems																					
	SBS Symptoms			0.41		0.04		0.15	0.25	-0.07	0.20	0.06		0.23		0.03		0.10	0.19	-0.07	0.16	0.03
Mental Health	Occupational Stress																					
	Job Stress			0.03			-0.16	0.06						0.02			-0.13	-0.05				
	Work-life balance											0.17										0.13
	Depression Symptoms			0.05			-0.06					-0.28		0.04			-0.06					-0.21
	Exhaustion			0.19		0.56	-0.59	0.28				0.05		0.14		0.53	-0.48	0.24				0.03
	Engagement						-0.03	-0.24	-0.21		-0.12	0.58					-0.02	-0.17	-0.18		-0.10	0.30
Social Health	Professional Isolation			0.10		0.11	-0.15	0.26	0.32			-0.38		0.07		0.11	-0.12	0.22	0.31			-0.23
	R-Rquared		**0.012**	**0.18**	**0.043**	**0.41**	**0.51**	**0.32**	**0.32**	**0.084**	**0.11**	**0.34**	**0.012**	**0.18**	**0.043**	**0.41**	**0.51**	**0.32**	**0.32**	**0.084**	**0.11**	**0.34**

- *Reference category*

all relationships in the table are significant at the 0.01 level (2-tailed),

expect for the relationships between the enclosed workspace and exhaustion which is significant at the 0.05 level

	Strong negative relationship
	Weak negative relationship
	Vey weak neutral relationship
	Weak positive relationship
	Strong positive relationship

7.3 EFFECTS ON ENVIRONMENTAL CHARACTERISTICS

This section describes the significant relationships between personal and environmental characteristics. As Structural Equation Modelling (SEM) does not allow the use of endogenous dummy variables, this means that only the relationships between personal characteristics and perceived organisational support are tested.

7.3.1 PERCEIVED ORGANISATIONAL SUPPORT

In the current study, perceived organizational support was measured without using an established scale. Instead, respondents were asked to report the extent to which they agreed with the statements on a five-point scale, ranging from never (=1) to always (=5) on four items: *1) The organisation pays enough attention to my work-life balance, 2) The organisation pays enough attention to health and vitality, 3) My supervisor supports me in balancing my work-life balance, and 4) My supervisor supports me in the areas of health and vitality.*

In this section, the significant effects of personal characteristics on perceived organisational support are discussed. These relationships are presented in order of relative strength using standardized coefficients (β), in which strong relationships are discussed first, followed by weaker relationships.

First, **education** was found to have the largest effect on perceived organisational support (*β= -0.09; p< .01*), in which high educational attainment is associated with reduced perceived organisational support. **Age** was also related to perceived organisational support, in which older teleworkers perceived reduced organisational support compared to younger teleworkers (*β= -0.05; p< .01*). This finding may be related to other aspects of telework that are not measured in this study, such as telework/job satisfaction. Earle (2003) suggests that younger people especially enjoy telework as they highly value freedom and work autonomy. Furthermore, previous research revealed that older workers experience fewer advantages of telework, due to a small negative effect of age on respondents' overall satisfaction with telework. (Nakrošiene et al., 2019).

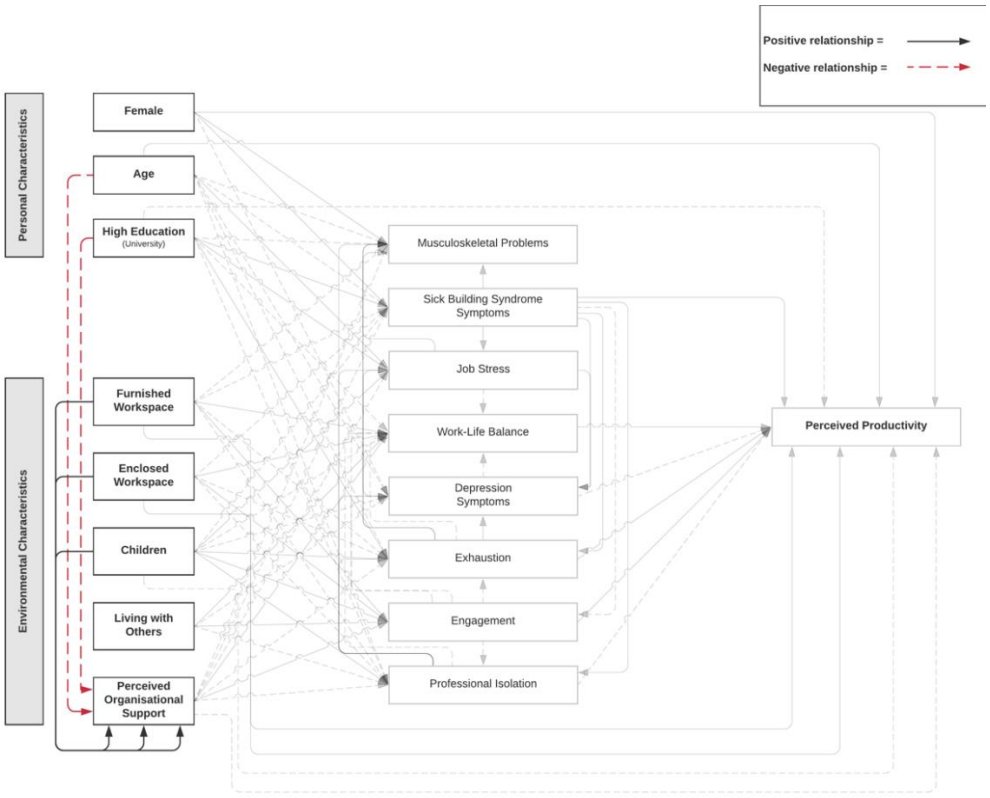


Figure 16 Reduced path model - Effects on Environmental Characteristics

The **at-home workplace** was revealed to influence the degree of support that is experienced by teleworkers. Working from a furnished workspace was found to positively affect perceived organisational support (*β= 0.05; p< .01*). Similarly, working from an enclosed workspace was positively related to perceived organisational support (*β= 0.03; p< .01*). No direct relationships between the physical workplace and the perceived organisational support of teleworkers were discussed in previous research.

Last, the presence of **children** in the household was found to positively influence the perceived organisational support of teleworkers (*β= 0.04; p< .01*). It is possible that this relationship can be explained through higher telework satisfaction among persons with children (Mokhtarian et al., 1998).

7.4 EFFECTS ON HEALTH

7.4.1 EFFECTS ON PHYSICAL HEALTH

In this study, the physical health of teleworkers is assessed through two types of physical ill-health: the number of musculoskeletal problems one suffered from, and the number of Sick Building Syndrome symptoms one suffered from. **Figure 17** presents the significant relationships between personal characteristics, environmental characteristics and health aspects.

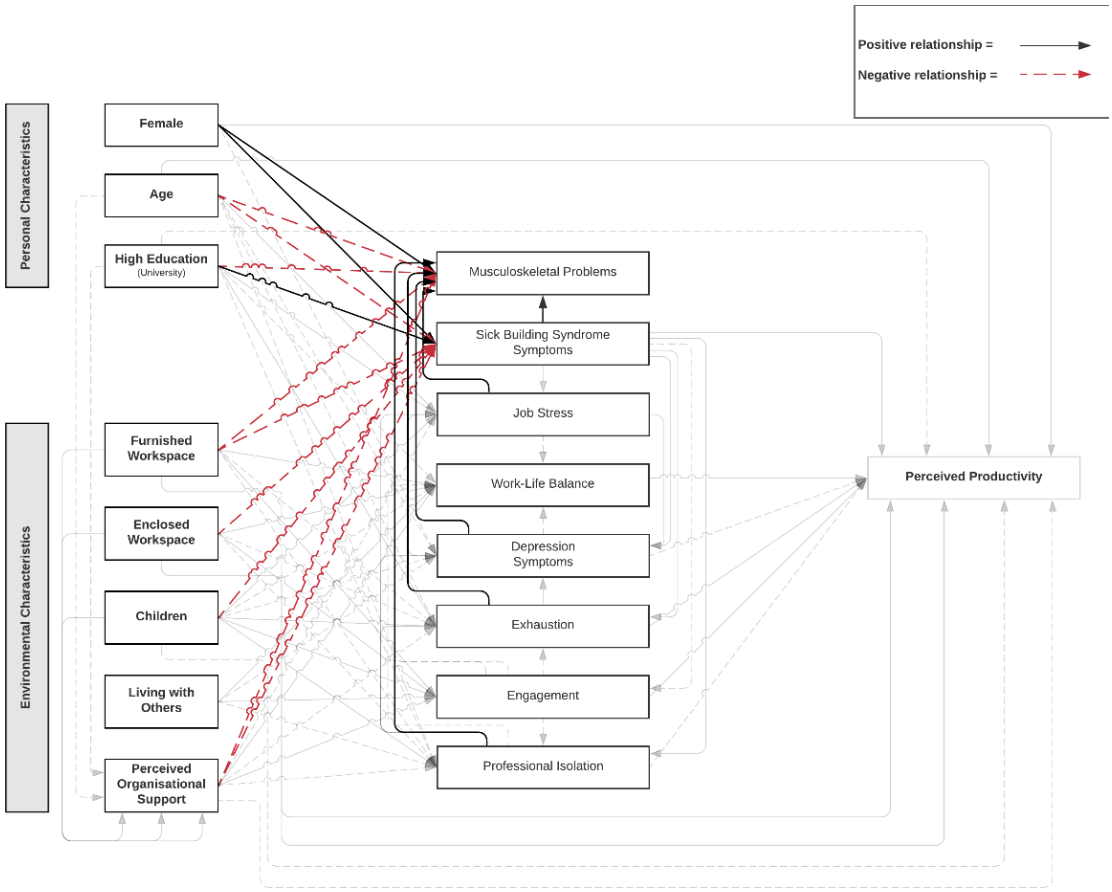


Figure 17 Reduced path model - Effects on Physical Health

7.4.1.1 MUSCULOSKELETAL HEALTH

In this study, the number of musculoskeletal problems one suffered from was measured, which consisted of having *1) pain in the neck and/or shoulders, 2) pain in hand and/or arms, 3) pain in the lower back, and 4) pain in legs and/or joints (e.g. knees or hips).*

In this section, the significant effects of the variables in the model on musculoskeletal health are discussed. First, the significant relationships between personal and environmental characteristics and musculoskeletal health are discussed. Following these relationships, the significant relationships between other aspects of health and musculoskeletal health are discussed. These relationships are presented in order of relative strength using standardized coefficients (β), in which strong relationships are discussed first, followed by weaker relationships.

PERSONAL AND ENVIRONMENTAL CHARACTERISTICS

Gender was found to have the largest effect on the emergence of musculoskeletal problems (*β= 0.09; p< .01*), in which females were found to have increased risks of poor musculoskeletal health. Although not specified on musculoskeletal health, these results are in line with previous findings from Mann & Holdsworth (2003) and Steward (2001) that found that female teleworkers experienced higher levels of physical ill-health than male teleworkers.

Perceived organisational support was found to influence the musculoskeletal health of teleworkers, as high perceived support was associated with reduced risks of musculoskeletal problems (*β= -0.07; p< .01*). Previous research by Nakrošiene et al. (2019) suggested that supervisor trust and support are important determinants of an individual's overall satisfaction with telework, which is in turn associated with employee health status (Aazami, 2015).

Teleworkers that worked from a furnished at-home workspace, with (for example) an adjustable desk chair, laptop stand, etc. were found to experience significantly fewer musculoskeletal problems (*β= -0.04; p< .01*). These results are in line with previous findings, which state that poorly designed workplaces negatively affect the employee's physical health through ergonomics which could prove very harmful for one's health in the long run (Beauregard et al., 2019; Crawford et al., 2011; Tavares, 2017). Age was found to be negatively related to musculoskeletal health (*β= -0.03; p< .01*), in which older teleworkers had reduced risks of poor musculoskeletal health. These findings are in contrast with findings by WHO (2018), which state that the emergence of common conditions including back and neck pain and osteoarthritis is more common among persons of older age.

Lastly, education was found to be significantly related to musculoskeletal health, as highly educated teleworkers were found to suffer from significantly fewer musculoskeletal problems (*β= -0.03; p< .01*). These findings are partly in line with Zajacova & Lawrence (2018), stating that high educational attainment is associated with better health through socio-economic factors such as higher income.

HEALTH

First, symptoms of Sick Building Syndrome (SBS) were found to have the largest effect on the emergence of musculoskeletal problems (*β= 0.23; p< .01*). Experiencing symptoms of SBS was found to be associated with an increased risk of musculoskeletal problems. These findings are partly in line with previous research on the relationship between neck pain and chronic headaches (e.g. Castien & De Hertogh, 2019). However, the causality between the two (i.e. SBS causing poor musculoskeletal health) appears to be contrasting previous research.

Musculoskeletal health was found to be affected by exhaustion, in which high exhaustion was associated with poor musculoskeletal health (*β= 0.14; p< .01*). This finding is in line with research by Hsu (2019) which reported higher physical exhaustion among persons with poor physical health. It was also found that musculoskeletal health is influenced by professional isolation, in which high professional isolation was found to be associated with poor musculoskeletal health (*β= 0.07; p< .01*). This finding partly ties in with previous research on the relationship between social isolation and physical health, in which socially isolation was associated with an increased risk of being in poor general, musculoskeletal and mental

health (e.g. Hämmig, 2019). However, the differences between social isolation and professional isolation must be considered when comparing the findings between the current study and existing research. Musculoskeletal health was also affected by **symptoms of depression**, in which experiencing symptoms of depression was associated with poor musculoskeletal problems (*ß= 0.04; p< .01*). This finding is partly in line with previous research stating that musculoskeletal disorders are important predictors of indicators of depression (e.g. Smith et al., 2019). Again, the causality between the two according to the path model (i.e. depression harming musculoskeletal health) appears to be in contrast with previous research.

Last, musculoskeletal health was found to be associated with **job stress** (*ß= 0.02; p< .01*). Teleworkers that experienced high levels of stress were found to suffer from significantly more musculoskeletal problems than those with less stress. These findings are similar to research by Crawford et al. (2011) which indicates that musculoskeletal problems are related to psychosocial symptoms including high work demands, low control over time, job insecurity, lack of interaction with colleagues and feeling overworked.

7.4.1.2 SICK BUILDING SYNDROME

In this study, the number of symptoms of Sick Building Syndrome one suffered from was measured, which consisted of having *1) irritation of the eyes, nose and/or throat, and 2) (frequent) headaches.*

In this section, the significant effects of the variables in the model on symptoms of Sick Building Syndrome (SBS) are discussed. This section only discusses the significant relationships between personal and environmental characteristics and symptoms of SBS, as no significant relationships were identified between the other health aspects and SBS symptoms. The significant relationships are presented in order of relative strength using standardized coefficients (β), in which strong relationships are discussed first, followed by weaker relationships.

PERSONAL AND ENVIRONMENTAL CHARACTERISTICS

Perceived organisational support was found to be significantly related to symptoms of Sick Building Syndrome (SBS), in which high perceived support was associated with reduced risks of experiencing symptoms of SBS *(ß= -0.12; p< .01).* Again, previous research by Nakrošiene et al. (2019) suggested that supervisor trust and support are important determinants of an individual's overall satisfaction with telework, which is in turn associated with employee health status (Aazami, 2015). **Age** was also found to be negatively related to the emergence of SBS symptoms (*ß= -0.11; p< .01*). Results indicate that older teleworkers are found to have reduced risks of experiencing SBS symptoms. These findings are partly in line with previous research regarding migraine headaches (MA), which are more common in the younger population, and their prevalence appears to decrease with age (Robblee & Singh, 2020). Moreover, tension-type headaches (TTH) are found to peak prevalence among those aged 30–39 years. The findings are in contrast with previous research regarding eyes, nose and throat irritation, in which the risk of eye dysfunction increases with age (e.g. de Paiva, 2017).

Gender was found to be significantly related to symptoms of SBS, in which women have increased risks of experiencing symptoms of SBS (*ß= 0.07; p< .01*). Again, although not specified on symptoms of Sick Building Syndrome, these findings are in line with previous research, which discussed that female teleworkers experienced higher levels of physical ill-health than male teleworkers (Mann & Holdsworth, 2003; Steward, 2001). **Education** was found to be significantly related to Sick Building Syndrome, as highly educated teleworkers were found to have increased risks of the emergence of symptoms of SBS (*ß= 0.04; p< .01*). This finding was in line with research by Schwartz (1998) who found an increasing prevalence of tension-type headaches (one of the symptoms of SBS) among increasing education levels. Conversely, these findings were in contrast with previous research that suggests that high educational

attainment is associated with better health (Zajacova & Lawrence, 2018). This finding from the current study was also in contrast with previous research regarding (migraine) headaches by Le et al. (2011), suggesting that low education may be related to low socioeconomic class and its association with migraine through factors such as stress, unhealthy lifestyle, etc.

Another significant relationship was found between the **at-home workspace** and experiencing symptoms of Sick Building Syndrome. The furnished workspace was found to be associated with reduced risks of experiencing SBS symptoms (*β= -0.03; p< .01*). Also, the enclosed workspace was found to be associated with reduced risks of experiencing SBS symptoms (*β= -0.02; p< .01*). Although the relationships were found to be relatively weak, they may be explained by other unidentified aspects of the at-home workspace, such as indoor temperature, lighting and noise (e.g. Boegheim, 2020; Colenberg et al., 2021). The presence of **children** in the household was also found to be significantly associated with the number of SBS symptoms one suffered from. Teleworkers with children experienced fewer symptoms of Sick Building Syndrome. Research by Aazami (2015) reveals that job satisfaction is related to the health status of employees (including headaches and psychological distress). Therefore, it is suggested that the decrease in the number of experienced SBS symptoms is related to job satisfaction, which is found to be higher among those having children (Mokhtarian et al., 1998). No direct relationships of household factors on the physical health of teleworkers were discussed in previous research.

7.4.2 EFFECTS ON MENTAL HEALTH

In this study, the mental health of teleworkers is assessed through five constructs related to mental health during telework: *1) job stress, 2) work-life balance, 3) depression, 4) exhaustion, and 5) engagement.* **Figure 18** presents the significant relationships between personal characteristics, environmental characteristics and these aspects of mental health.

7.4.2.1 JOB STRESS

In this study, the job stress was measured using parts of the 'new job stress scale' by Shukla and Srivastava (2016). Six items were rated by the respondents on a five-point scale (1 = strongly disagree; 5 = strongly agree), consisting of *1) I have a lot of work and fear that very little time to do it, 2) I feel so burdened that even a day without work seems bad, 3) I feel that I never take a leave, 4) My job makes me nervous, 5) Many a time, my job becomes a big burden, and 6) I feel bad when I take a leave.*

In this section, the significant effects of the variables in the model on job stress are discussed. First, the significant relationships between personal and environmental characteristics and job stress are discussed. Following these relationships, the significant relationships between other aspects of health and job stress are discussed. These relationships are presented in order of relative strength using standardized coefficients (β), in which strong relationships are discussed first, followed by weaker relationships.

PERSONAL AND ENVIRONMENTAL CHARACTERISTICS

Job stress was found to significantly related to **perceived organisational support**, in which high perceived support was associated with reduced job stress (*β= -0.08; p< .01*). Trust and support are very important aspects of full-time telework, as interactions are mainly virtual (Yakovleva et al., 2010). This finding suggests that the organisation can play a key role in supporting healthy teleworking habits and how to deal with stress, similar to the key role that employers play in supporting the early identification of depression when teleworking (Center for Workplace Mental Health, 2021).

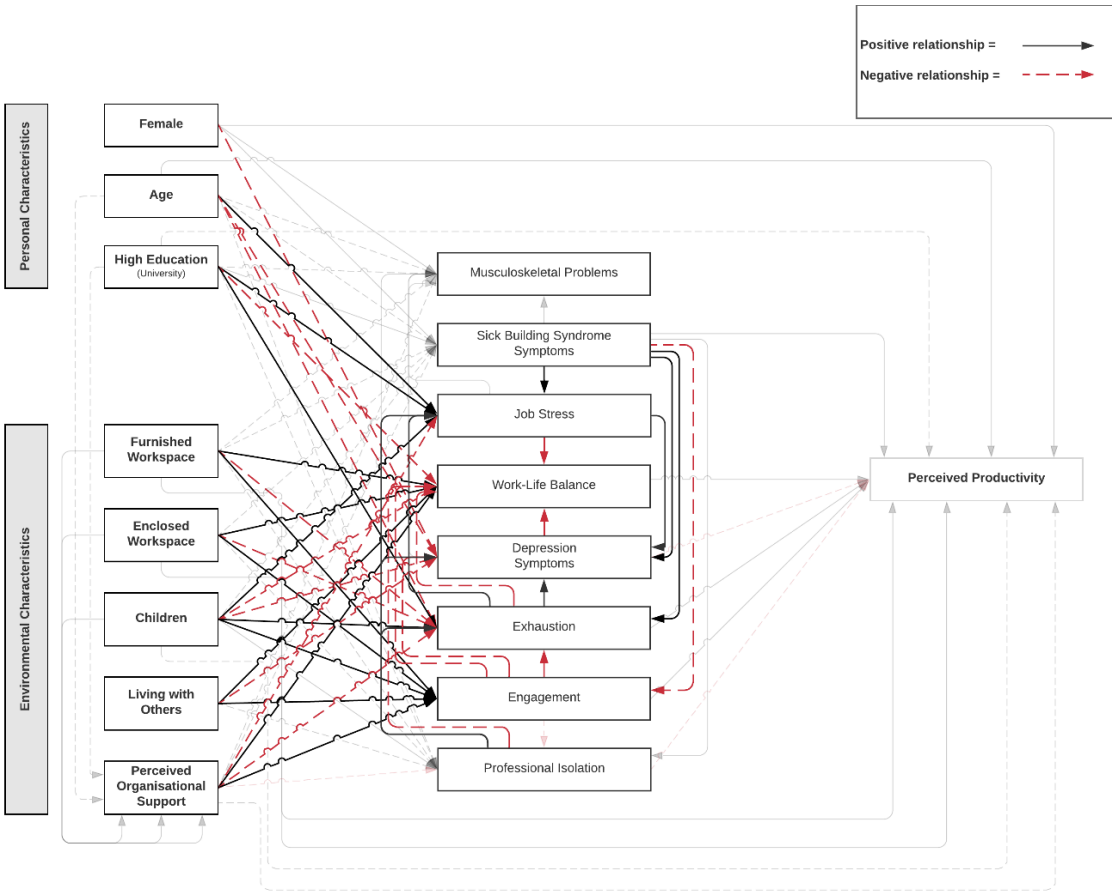


Figure 18 Reduced path model - Effects on Mental Health

Education was also found to be significantly related to job stress, in which high educational attainment was associated with increased job stress compared to those with lower educational attainment (*β= 0.06; p< .01*). These findings are in contrast with research by Lunau et al. (2015) which found that people with a lower educational level experience higher amounts of work stress, in which educational differences were pronounced in Eastern European countries compared to Northern European countries. The presence of **children** in the household was also found to be significantly related to job stress, in which teleworkers with children report higher job stress (*β= 0.04; p< .01*). These findings are in line with research by Song and Gao (2018) suggesting that telework is more stressful because their children are around while they are working at home.

Age was also found to be weakly related to job stress, in which older age was associated with increased job stress (*β= 0.03; p< .01*). Previous research reports contrasting findings compared to the current research, in which younger age was found to be associated with greater work stress (Hsu, 2019; Mahmood et al., 2013).

HEALTH

Exhaustion was found to have a very large effect on job stress, in which high exhaustion was associated with increased job stress (*β= 0.53; p< .01*). These findings are in line with previous research, in which a significant positive relationship between job stress and emotional exhaustion was found (e.g. Abarghouei et al., 2016; Sardeshmukh et al., 2012). **Professional isolation** was also found to be significantly related to job stress, in which high professional isolation was associated with increased job stress (*β= 0.11; p< .01*). These findings are in line with research by Toscano & Zappalà (2020), in which it was found that social isolation and stress are strongly related.

Lastly, job stress was also found to be related to experiencing symptoms of **Sick Building Syndrome**, in which experiencing symptoms of SBS was associated with increased job stress (*β= 0.03; p< .01*). These findings are in line with previous research discussing the strong association between experienced stress and the frequency and intensity of tension-type headaches, stress and migraines (van der Doef & Schelvis, 2019), as well as eye irritation and stress (Yılmaz et al., 2015).

7.4.2.2 WORK-LIFE BALANCE

In this study, job stress was measured using a part of the work-life balance scale developed by Brough et al. (2009). Out of the four items in the scale, only two were used by respondents to rate the following items on a five-point scale (1 = strongly disagree; 5 = strongly agree): 1) *I am able to balance between time at work and time at other activities, 2) I feel that the job and other activities are currently balanced*.

In this section, the significant effects of the variables in the model on the work-life balance are discussed. First, the significant relationships between personal and environmental characteristics and the work-life balance are discussed. Following these relationships, the significant relationships between other aspects of health and work-life balance are discussed. These relationships are presented in order of relative strength using standardized coefficients (β), in which strong relationships are discussed first, followed by weaker relationships.

PERSONAL AND ENVIRONMENTAL CHARACTERISTICS

Perceived organisational support was found to be significantly related to the work-life balance of teleworkers, in which high perceived support was associated with reduced job stress (*β= 0.07; p< .01*). These findings are in line with previous research by Mesimo-ogunsanya (2017) who found that organisational support leads to positive employee attitudes such as reduced stress of balancing work and family responsibilities, and reduced work-life conflict. Recent research by Mishra and Bharti (2020) which was also conducted during the COVID-19 pandemic emphasized that, although the organisation takes care of the well-being of the employees, maintaining the work-life balance remains a critical task for the employees in which the organization cannot help employees in maintaining the work-life balance.

The presence of **children** in the household was also found to be significantly related to the work-life balance, in which teleworkers with children report a reduced work-life balance compared to those without children (*β= -0.07; p< .01*). This finding is in line with previous research by Golden et al. (2006) and Nakrošiene et al. (2019) whom both suggest a similar relationship in which the size of the household and having young children negatively affects the work-life balance of teleworkers. Another significant relationship between **education** and the work-life balance was also revealed, in which high educational attainment was associated with a reduced work-life balance compared to those with lower educational attainment (*β= -0.06; p< .01*). This finding ties in with the relationship between education and job stress, as poor work-life balance is associated with increased job stress (Song & Gao, 2018). The result from the current study is in line with previous research by Kromydas (2020), who suggested that work-life balance was negatively affected by educational attainment, however, the effect is rather small.

The **at-home workspace** was identified to be an important determinant in the work-life balance of teleworkers. Teleworkers that worked from a **furnished at-home workspace** were found to be significantly more satisfied with their work-life balance compared to those working from non-furnished workspaces (*β= 0.04; p< .01*). Similarly, those who worked from enclosed at-home workspaces were also found to be significantly more satisfied with their work-life balance compared to those working from non-enclosed workspaces (*β= 0.04; p< .01*).

These findings are in line with previous research, which identified that working in common areas is revealed to make work too permeable to interruptions, and makes it difficult to set a clear boundary between work-time and personal-time (Ammons & Markham, 2004).

Another significant relationship was identified between the work-life balance of teleworkers living alone and those **living with others.** Results indicated that teleworkers that lived alone have a poorer work-life balance than those who lived together with their partner, parents or housemates (*β= 0.03; p< .01*). This finding is in direct contrast with the general view that living with others while teleworking is associated with a poorer work-life balance due to conflicts demands of work and home life (Mann & Holdsworth, 2003). These findings from the path model might suggest that living alone is associated with workaholism and not knowing when to stop working to such an extent that it damages health, including logging onto to work past normal hours and over-working (Grant et al., 2013). Research by Ammons & Markham (2004) discusses the role of family members or housemates to act as border-keepers for limiting workaholic tendencies, by monitoring the work hours of teleworkers and complaining when they worked too long. Cohabiting with others may also provide 'cues' (such as children coming home from school or spouses arriving home from work) to mindfully mark the end of work time (Ammons & Markham, 2004).

HEALTH

Exhaustion was found to have a very large effect on the work-life balance, in which high exhaustion was associated with reduced work-life balance (*β= -0.48; p< .01*). These findings are supported by Sirgy and Lee (2018), who found that the work-life balance reduces stress-related outcomes such as psychological distress, emotional exhaustion, anxiety, and depression. Again, the causality between the two variables according to the path model (i.e. exhaustion affecting the work-life balance) appears to be contrasting previous research. Also, **job stress** was found to negatively influence the work-life balance (*β= -0.13; p< .01*). Previous research revealed that poor work-life balance resulted in increased job stress due to conflicting demands of work versus the home (Mann & Holdsworth, 2003; Song & Gao, 2018). However, the causality between the two variables, according to the path model, (i.e. job stress affecting the work-life balance) appears to be contrasting previous research.

Professional isolation was also found to be significantly related to the work-life balance, in which high professional isolation was associated with reduced work-life balance (*β= -0.12; p< .01*). No direct relationships between professional isolation and the work-life balance of teleworkers were discussed in previous research.

Also, **depression** was negatively related to the work-life balance, in which experiencing depressive symptoms is associated with reduced work-life balance (*β= -0.06; p< .01*). This finding is partly in line with previous research in which the relationship between the work-life balance and depressive symptoms are discussed (e.g. Sirgy & Lee, 2018; Sprung & Rogers, 2020). However, research by Sprung and Rogers (2020) revealed a reverse causality compared to the current research (i.e. depression affecting the work-life balance, compared to the work-life balance having an effect depression). Furthermore, the study by Sprung and Rogers (2020) also demonstrated an indirect effect of work-life balance on (students') depressive symptoms mediated by stress, while no direct relationship between work-life balance and depression was found.

Last, a very small negative effect of **engagement** was found on work-life balance, which means that high engagement is associated with (slightly) reduced work-life balance (*β= -0.02; p< .01*). This finding is supported by an extensive literature review by Wood et al. (2020), in which the causality between engagement and work-life balance are discussed in both ways. However, the negative effect of engagement on work-life balance is not previously discussed in other studies. This slight negative effect

may suggest that highly engaged teleworkers are more prone to overwork and have difficulty in switching off, thus negatively affecting the work-life balance.

7.4.2.3 DEPRESSION

In this study, the number of symptoms of depression one suffered from was measured, which consisted of having *1) difficulty concentrating on tasks, 2) little interest or enjoyment in doing things, 3) feeling gloomy, depressed or hopeless, and 4) poor appetite or overeating.*

In this section, the significant effects of the variables in the model on depressive symptoms are discussed. First, the significant relationships between personal and environmental characteristics and depression are discussed. Following these relationships, the significant relationships between other aspects of health and depression are discussed. These relationships are presented in order of relative strength using standardized coefficients (β), in which strong relationships are discussed first, followed by weaker relationships.

PERSONAL AND ENVIRONMENTAL CHARACTERISTICS

First, a (relatively large) significant relationship between **age** and depression was identified. Results indicated that older teleworkers suffered from fewer symptoms of depression compared to younger teleworkers (*β= -0.12; p< .01*). These findings are in line with findings by Henke et al. (2016), who identified significant variations in the percentage of employees with high health risks by age, in which both office workers and teleworkers in younger age groups were identified to have an increased risk for depression. Furthermore, this finding is supported by which Pieh et al. (2020) and Weitzer et al. (2021), who reported an especially heavy mental health burden among young (Austrian) adults during the COVID-19 lockdowns, and that the quality of life of younger Austrians was affected more than other age groups.

Living alone was also found to be significantly associated with depression. Teleworkers that lived alone suffered from significantly more symptoms of depression than those living with others (*β= -0.05; p< .01*). This finding is in line with previous research regarding living arrangements and depression, in which those living alone reported significantly higher depression scores than other adults (Posel, 2021). Regarding **gender**, teleworking women were found to suffer from significantly fewer depression symptoms compared to men (*β= -0.03; p< .01*). This finding is in contrast with findings by Henke et al. (2016), who found that females have an increased risk for depression and stress compared to men. The presence of **children** in the household was also found to be significantly related to depressive symptoms, in which teleworkers with children report significantly fewer symptoms of depression compared to those without children (*β= -0.02; p< .01*). No research was found supporting or contrasting these findings.

HEALTH

Depression was found to be significantly related to **exhaustion**, in which high exhaustion was associated with an increased risk for depressive symptoms (*β= 0.24; p< .01*). This finding is supported by previous research discussing the relationship between exhaustion and depression, as (extreme) exhaustion is also considered a possible symptom of depression. Furthermore, previous research suggests that exhaustion and depression are related through burnout (Koutsimani et al., 2019). **Professional isolation** was also found to be related to depression, in which high professional isolation was associated with an increased risk for depressive symptoms (*β= 0.22; p< .01*). This finding is in line with research by Santini et al. (2020) which indicates that (social) isolation and loneliness increase the risk of mental disorders, such as depression.

Engagement was found to have a negative influence on depression, as high engagement was associated with a reduced risk of depressive symptoms (*β= -0.17; p< .01*). The findings are in line with previous research, in which high levels of work engagement were found to predict lower levels of psychological health conditions such as anxiety and depression (Innstrand et al., 2012).

Sick Building Syndrome (SBS) was found to be related to depression, in which the emergence of symptoms of SBS was associated with an increased risk for depressive symptoms (*β= 0.10; p< .01*). These findings concur with previous research which found that migraine headaches can play an important role in increasing the incidence of depression, while tension-type headaches and tension-type headaches can play a role in increasing the incidence of anxiety (e.g. Lampl et al., 2016).

Last, **job stress** was found to be related to depression, as high job stress was found to be associated with an increased risk for depressive symptoms (*β= -0.05; p< .01*). This finding is in line with research by Clays et al. (2007) which identified that job stress is a risk factor for developing symptoms of depression.

7.4.2.4 EXHAUSTION

For the measurement of exhaustion or fatigue in this study, no established measurement scale was used. Instead, four items were created to measure exhaustion which was rated on a five-point scale ranging from strongly disagree (=1) to strongly agree (=5): *1) I can leave work at the end of the homework day, 2) I can relax well after a day's work at home, 3) I feel mentally tired when I start work in the morning and 4) I feel mentally exhausted by my work at the end of the day.*

In this section, the significant effects of the variables in the model on exhaustion are discussed. First, the significant relationships between personal and environmental characteristics and exhaustion are discussed. Following these relationships, the significant relationships between other aspects of health and exhaustion are discussed. These relationships are presented in order of relative strength using standardized coefficients (β), in which strong relationships are discussed first, followed by weaker relationships.

PERSONAL AND ENVIRONMENTAL CHARACTERISTICS

First, **perceived organisational support** was found to play a relatively large role in the degree of exhaustion that is experienced by teleworkers. High perceived support was found to be associated with reduced exhaustion (*β= -0.14; p< .01*). This finding is in line with research by Alcover et al. (2018) which identified a very strong negative relationship between perceived organisational support and exhaustion.

Age was found to be significantly associated with exhaustion, in which older teleworkers were identified as having lower levels of exhaustion compared to younger teleworkers (*β= -0.08; p< .01*). This finding is in contrast with research by Hsu (2019) which reported significantly higher physical exhaustion among employees aged 55–64 compared with the other age groups. Furthermore, both Hsu (2019) and Tükel et al. (2018) found no significant differences among age groups regarding emotional exhaustion. **Education** was also found to be significantly related to the exhaustion of teleworkers, as high educational attainment was found to be associated with increased exhaustion (*β= 0.08; p< .01*). This finding is in contrast with research by Hsu (2019), who found that exhaustion was predicted by lower educational attainment.

The **at-home workspace** was found to be significantly related to the exhaustion of teleworkers. Teleworkers that worked from a **furnished at-home workspace** were found to be slightly less exhausted compared to those working from non-furnished workspaces (*β= -0.02; p< .01*). Similarly, those who worked from **enclosed at-home workspaces** were also found to be slightly less exhausted compared to those working from non-enclosed workspaces (*β= -0.01; p= 0.04*). This finding is in line with research by Rathert et al. (2012), who found that well-designed physical environments decrease exhaustion.

Last, the presence of **children** in the household was also found to be significantly related to increased exhaustion (*β= 0.02; p< .01*). This finding is partly in line with research by Tijdink et al. (2014) who found that the presence of children was significantly associated with higher emotional exhaustion and with at least one other component score of burnout.

HEALTH

Professional isolation was found to have a very large effect on exhaustion, in which high professional isolation was associated with increased exhaustion (*β= 0.31; p< .01*). This finding concurs with research by Golden et al. (2008), in which job demands (i.e. aspects of the job that require sustained physical and/or psychological efforts) predict increased stress and exhaustion. It is argued that the perception of being separated and the lack of opportunities for emotional and social interaction with colleagues can be considered a job demand. Therefore, suggesting that professional isolation predicts increased stress and exhaustion.

Experiencing symptoms of **Sick Building Syndrome** was found to influence exhaustion, as the emergence of symptoms of SBS were associated with increased exhaustion (*β= 0.19; p< .01*). This finding is partly in line with previous research in which headaches and respiratory problems were found to be related to burnout and exhaustion (Salvagioni et al., 2017).

Last, (work) **engagement** was found to be related to exhaustion, in which high engagement was found to be associated with reduced exhaustion (*β= -0.18; p< .01*). These findings are in line with previous research by Chen et al., (2020) in which a strong negative relationship between work engagement and emotional exhaustion was observed for high-conscientiousness individuals.

7.4.2.5 ENGAGEMENT

In this study, engagement was measured through parts of the 'Utrecht work engagement scale' (UWES) by Schaufeli & Bakker (2004a). Six out of 17 items in the scale were used and rated by respondents on a five-point scale ranging from strongly disagree (=1) to strongly agree (=5): 1) *I am enthusiastic about my work, 2) My work inspires me, 3) When I get up in the morning, I feel like going to work, 4) When I am working very intensively, I feel happy, 5) I am proud of the work I do, and 6) I am immersed by my work.*

In this section, the significant effects of the variables in the model on (work) engagement are discussed. First, the significant relationships between personal and environmental characteristics and engagement are discussed. Following these relationships, the significant relationships between other aspects of health and engagement are discussed. These relationships are presented in order of relative strength using standardized coefficients (β), in which strong relationships are discussed first, followed by weaker relationships.

PERSONAL AND ENVIRONMENTAL CHARACTERISTICS

First, **perceived organisational support** was found to be related to the (work) engagement of teleworkers. High perceived support was found to be associated with increased engagement (*β= 0.26; p< .01*). Research by Tkalac Verčič (2021) supports these findings by reporting a strong positive relationship between perceived organisational support and work engagement.

The at-home workspace was found to be significantly related to engagement, in which working from a **furnished workspace** (*β= 0.05; p< .01)* and working from an **enclosed workspace** (*β= 0.02; p< .01*) were both found to increase engagement. These findings are partly in line with previous research which suggests that the relationship between the physical environment and work engagement may be related to unidentified aspects of the physical environment. Research by Duque et al. (2020) found that several

aspects of the physical environment (such as sound comfort, ergonomics, layout, privacy, indoor temperature and air quality) influence work engagement, possibly through perceived autonomy and control.

Living alone was also found to be significantly associated with work engagement, in which teleworkers that lived with others reported higher engagement compared to those living alone (*β= 0.04; p< .01*). The presence of children in the household was also found to be significantly related to increased engagement (*β= 0.02; p< .01*). No research was found supporting or contrasting these findings.

HEALTH

Work engagement was found to be influenced by the emergence of Sick Building Syndrome symptoms, in which symptoms of SBS were associated with reduced engagement (*β= -0.07; p< .01*). These findings are in line with previous research, in which headaches were negatively related to engagement (Malmberg-Ceder et al., 2020).

7.4.3 EFFECTS ON SOCIAL HEALTH

In this study, the social health of teleworkers is assessed through the measurement of professional isolation that is experienced during obliged telework. Figure 19 presents the significant relationships between personal characteristics, environmental characteristics and professional isolation.

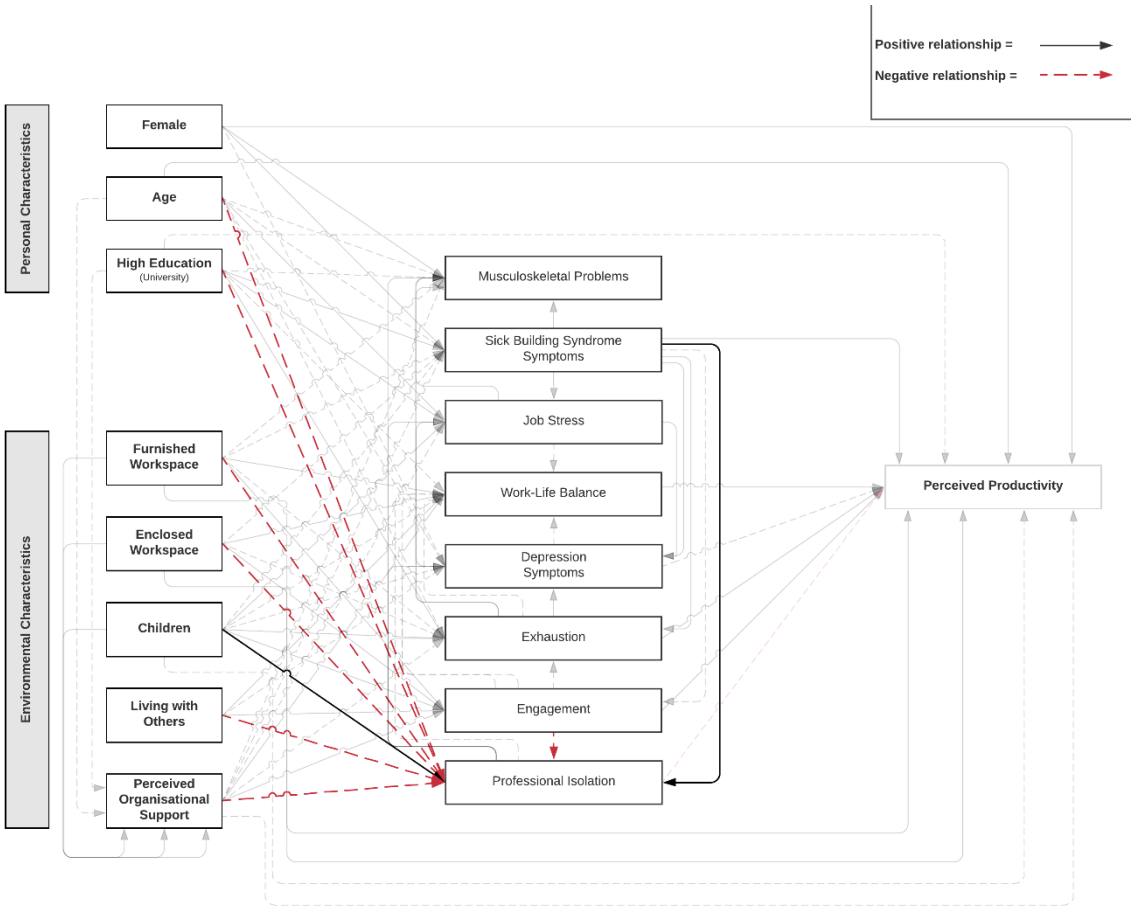


Figure 19 Reduced path model - Effects on Social Health

7.4.3.1 PROFESSIONAL ISOLATION

For measuring the degree of social isolation in teleworkers, seven items of the Professional Isolation scale developed by Golden et al. (2008) were used and rated by respondents on a five-point scale

ranging from strongly disagree (=1) to strongly agree (=5): *1) I feel left out on activities and meetings that could enhance my career, 2) I miss out on opportunities to be mentored, 3) I feel out of the loop, 4) I miss face-to-face contact with co-workers, 5) I feel isolated, 6) I miss the emotional support of co-workers, and 7) I miss informal interaction with others.*

In this section, the significant effects of the variables in the model on professional isolation are discussed. First, the significant relationships between personal and environmental characteristics and professional isolation are discussed. Following these relationships, the significant relationships between other aspects of health and professional isolation are discussed. These relationships are presented in order of relative strength using standardized coefficients (β), in which strong relationships are discussed first, followed by weaker relationships.

PERSONAL AND ENVIRONMENTAL CHARACTERISTICS

Perceived organisational support was found to play a large role in the professional isolation of teleworkers, in which high perceived support was found to be associated with reduced professional isolation (*β= -0.16; p< .01*). These findings are in line with research by Bentley et al. (2016) which found that organisational (social) support and teleworker support was associated with reduced professional isolation and increased job satisfaction.

Age was found to be significantly related to professional isolation, as younger teleworkers reported increased professional isolation compared to older teleworkers (*β= -0.08; p< .01*). The path model also revealed a significant relationship between education and professional isolation. High educational attainment was found to be associated with increased professional isolation compared to those with lower levels of education (*β= 0.06; p< .01*). No research was found supporting or contrasting these findings regarding professional isolation.

Both living with others and the presence of children in the household were found to be related to professional isolation. Living with others was found to be associated with reduced professional isolation (*β= -0.05; p< .01*), while the presence of children was found to be associated with increased professional isolation (*β= 0.03; p< .01*). No research was found supporting or contrasting these findings.

Last, the at-home workspace was found to be significantly related to professional isolation, in which both working from a furnished workspace and working from an enclosed workspace were found to reduce feelings of professional isolation (both: *β= -0.03; p< .01*). No research was found contrasting or supporting these findings directly, however, it is expected that the working form enclosed workspaces may strengthen feelings of social isolation – which may result in increased feelings of professional isolation as well.

HEALTH

First, professional isolation was found to be related to Sick Building Syndrome (SBS). It was found that the emergence of SBS symptoms was associated with increased professional isolation (*β= 0.16; p< .01*). This finding concurs with recent research by Goadsby et al. (2021) in which the COVID-19 pandemic has been associated with headache frequency and severity increased as a result of increased psychological stress, (social) isolation, sleep disruption and poor dietary habits.

Engagement was also found to be related to professional isolation, in which high engagement was associated with reduced professional isolation (*β= -0.10; p< .01*). This finding is in line with previous research in which high isolation was found to negatively impact work engagement (e.g. Arora, 2012; Bentein et al., 2017).

7.5 EFFECTS ON PERCEIVED PRODUCTIVITY

In this section, the significant effects of the variables in the model on perceived productivity are discussed, in which perceived productivity was measured on a 10-point scale (see Figure 20).

First, the significant relationships between personal and environmental characteristics and perceived productivity are discussed. Following these relationships, the significant relationships between aspects of health and perceived productivity are discussed. These relationships are presented in order of relative strength using standardized coefficients (β), in which strong relationships are discussed first, followed by weaker relationships.

PERSONAL AND ENVIRONMENTAL CHARACTERISTICS

Gender was found to play a relatively large role in the perceived productivity of teleworkers. Women were found to report significantly higher perceived productivity compared to men ($\beta = 0.10$; $p < .01$). Although another measure of productivity is used (namely, perceived productivity vs. objective productivity), this finding is in contrast with research by Ammons and Markham (2004) and Bloom et al. (2015). Research by Ammons & Markham (2004) revealed that teleworking men found that their work obligations spilt over into home time, while women experienced the opposite problem: teleworking women found their home tasks and responsibilities spilling over into work time – negatively affecting their productivity. These results from the path model are also in contrast with findings by Bloom et al. (2015), which states that there are no significant gender differences in productivity.

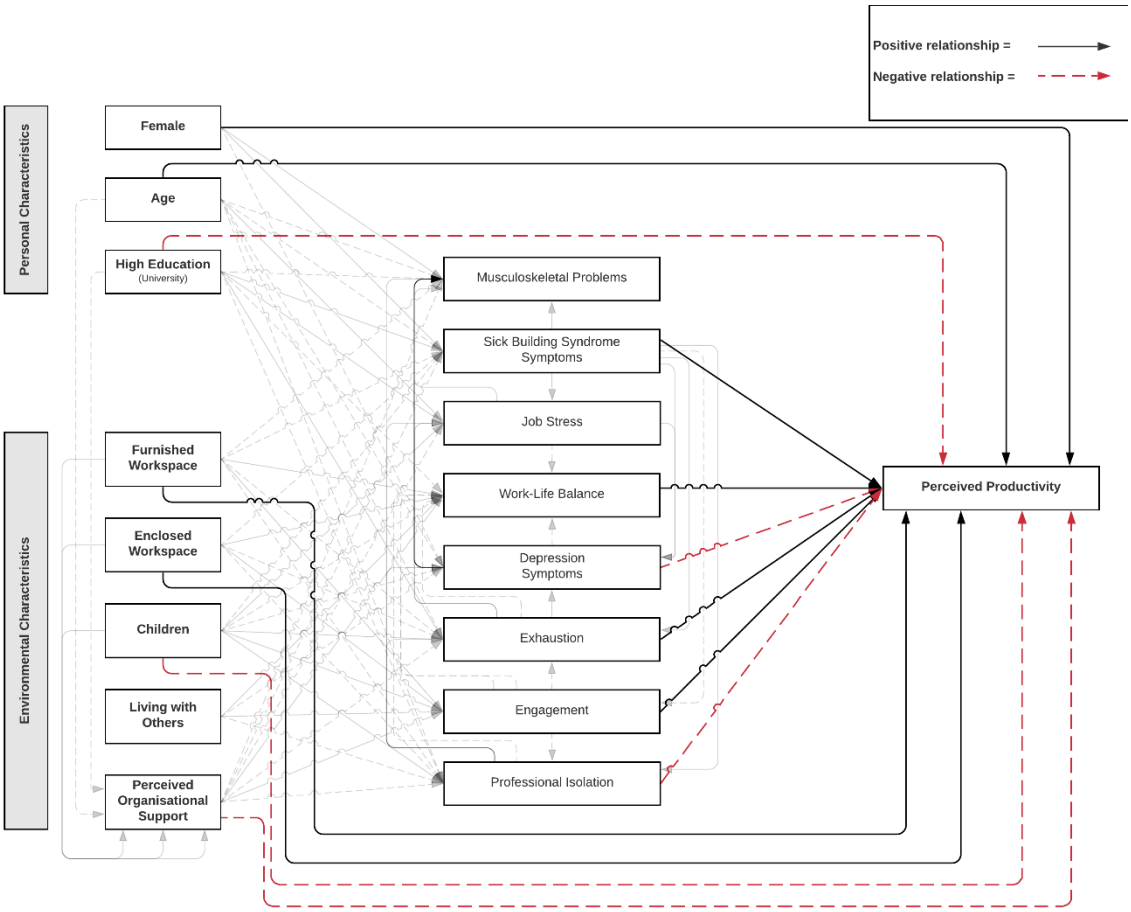


Figure 20 Reduced path model - Effects on Perceived Productivity

Perceived organisational support was identified to be significantly related to perceived productivity, in which high perceived support was found to be associated with reduced perceived productivity (*β= -0.05; p< .01*). This finding is in line with research by Oakman et al. (2020), in which it was found that telework could have negative or positive impacts, depending on various systemic moderators such as the demands of the home environment, level of organisational support, and social connections external to work.

Age was identified to be significantly related to perceived productivity, in which older teleworkers were found to report higher perceived productivity (*β= 0.03; p< .01*). Although no research was found contrasting or supporting these findings directly, it is suggested that age is positively related to productivity through the relationship between job tenure and age, and the relationship between tenure and productivity. Ng & Feldman (2013) found that job tenure was largely unrelated to core task performance and thus is only very weakly related to self-rated performance and ratings by supervisors. Conversely, Bloom et al. (2015) discussed that the relationship between teleworker age and (objective) productivity was insignificant.

Education was also found to be related to perceived productivity, in which high educational attainment was associated with reduced perceived productivity (*β= -0.02; p< .01*). These findings are in contrast with research by Ng and Feldman (2009) on office workers, who identified that education level is positively related to productivity. The findings by Ng and Feldman (2009) indicate that highly-educated employees are better prepared to work autonomously and are less interdependent, which are important skills in successful telework according to Bailey and Kurland (2002) and Hobbs and Armstrong (1998).

The at-home workspace was found to be related to perceived productivity, as teleworkers with furnished workspaces (*β= 0.01; p< .01)* and enclosed workspaces *(β= 0.02; p< .01*) reported higher perceived productivity compared to those working from a non-furnished and non-enclosed workspace. These findings are partly in line with research by Nakrošiene et al. (2019) that emphasizes that a suitable at-home workplace is of utmost importance for the success of telework. It was found that the suitability of the workplace strengthened all measured telework outcomes in the study, such as overall satisfaction with telework and increased self-reported productivity (Nakrošiene et al., 2019). Working in common areas is revealed to make work too permeable to interruptions, and makes it difficult to set a clear boundary between work-time and personal-time (Ammons & Markham, 2004), thus negatively affecting productivity.

Last, the presence of children in the household was also found to be significantly related to reduced perceived productivity (*β= -0.02; p< .01*). These findings are in line with previous research, which found that the presence of (young) children is associated with spending time on non-work related issues, thus negatively influencing productivity (e.g. Mann & Holdsworth, 2003; Nakrošiene et al., 2019).

HEALTH

Engagement was found to be very strongly related to perceived productivity, in which high engagement was associated with increased perceived productivity (*β= 0.30; p< .01*). This finding is in line with research by Hanaysha (2016), which identified that work engagement increases employee productivity.

Second, professional isolation was found to be strongly related to perceived productivity, in which high professional isolation was associated with reduced perceived productivity (*β= -0.23; p< .01*). This finding is in line with research by Toscano & Zappalà (2020), in which it was identified that (social) isolation and stress were negatively related to an individual's perception of productivity. Depression was also found to be strongly related to perceived productivity, in which experiencing depressive symptoms was

associated with reduced perceived productivity (*β= -0.21; p< .01*). This finding concurs with previous research discussing depression-related productivity loss (e.g. Center for Workplace Mental Health, 2021; McTernan et al., 2013)

The work-life balance was found to be positively related to the perceived productivity of teleworkers. High work-life balance was associated with increased perceived productivity (*β= 0.13; p< .01*). These findings are in line with previous research discussing the role of work-life balance in a person's quality of work and job performance through reduced time spent on household tasks and reduced likelihood of work-family conflicts (e.g. Golden et al., 2006; Grant et al., 2013; Ward, 2017)

Sick Building Syndrome and exhaustion were found to both be associated with increased perceived productivity. It was found that the emergence of SBS symptoms was associated with increased perceived productivity (*β= 0.03; p< .01*). These findings are in contrast with previous research discussing the productivity loss attributable to headaches (Selekler et al., 2015). The findings from the current study suggest that teleworkers who experience headaches and/or irritation of the eyes/throat/nose perceived themselves to be more productive. High exhaustion was also found to be associated with increased perceived productivity (*β= 0.03; p< .01*). These findings are in contrast to research by Aboagye et al. (2019) in which it was found that exhaustion negatively influences work performance through presenteeism and absenteeism.

7.6 MEDIATION ANALYSIS

Table 50 presents the direct, indirect and total effects of the different significant relationships in the path model.

Table 50 Mediation analysis

Relationship	Direct Effect	Indirect Effect	Total Effect	*Proportion of mediation*
Personal Characteristics				
GEN→PP	0.24		0.24	*0.00*
AGE→(POS, MSK, SBS, JS, DEPR, EXH, ISO)→PP	0.02	0.07	0.09	*0.78*
EDU→(POS, MSK, SBS, JS, WLB, EXH, ISO)→PP	-0.05	-0.13	-0.18	*0.72*
Environmental Characteristics				
FW→(POS, MSK, SBS, WLB, EXH, ENG, ISO)→PP	0.03	0.12	0.15	*0.80*
EW→(POS, SBS, WLB, EXH, ENG, ISO)→PP	0.05	0.08	0.13	*0.62*
CHI→(POS, SBS, JS, WLB, DEPR, EXH, ENG, ISO)→PP	-0.05	-0.01	-0.06	*0.17*
LWO→WLB, DEPR, ENG, ISO→PP		0.14	0.14	*1.00*
POS→(MSK, SBS, JS, WLB, EXH, ENG, ISO)→PP	-0.09	0.30	0.21	*1.43*

Note:

Gender	*= GEN*	Musculoskeletal problems	*= MSK*
Age	*= AGE*	Sick Building Syndrome symptoms	*= SBS*
Education	*= EDU*	Job stress	*= JS*
Furnished Workspace	*= FW*	Work-life balance	*= WLB*
Enclosed Workspace	*= EW*	Depression Symptoms	*= DEPR*
Children	*= CHI*	Exhaustion	*= EXH*
Living with Others	*= LWO*	Engagement	*= ENG*
Perceived Organisational Support	*= POS*	Professional Isolation	*= PI*
		Perceived Productvity	*= PP*

Following the theory discussed in Section 4.6.4, complete mediation was identified in the relationship between living with others and perceived productivity. Thus, it was found that this specific household factor did not affect perceived productivity directly, but only indirectly through mediators such as work-life balance, depression, engagement and professional isolation.

Through the measure of the proportion of mediation, it is revealed in Table 50 that the total effects from personal and environmental characteristics on perceived productivity consist to a large extent out of indirect effects from mediator variables.

PERSONAL CHARACTERISTICS

Gender is found to affect perceived productivity only directly, while age affects perceived productivity indirectly for 78%, through support, sick building syndrome, job stress, depression, exhaustion, and professional isolation. Similarly, education is found to affect perceived productivity directly only to a small extent, as 72% of the total effects found to be indirect through support, sick building syndrome, job stress, work-life balance, exhaustion, and professional isolation.

ENVIRONMENTAL CHARACTERISTICS

The effects from working from a furnished at-home workspace on perceived productivity were found to consist for 80% out of indirect effects. Support, sick building syndrome, work-life balance, exhaustion, engagement, and professional isolation were found to mediate a large extent of the effects of working from a furnished at-home workspace on perceived productivity.

A slightly smaller proportion of the effects from working from an enclosed at-home workspace on perceived productivity was found to consist out of indirect effects from mediator variables (62%). These mediator variables were identified as support, sick building syndrome, work-life balance, exhaustion, engagement, and professional isolation.

Whether a teleworker has children is found to affect perceived productivity mostly through direct effects. Only 17% of the total effects are indirect effects, which can be attributed to support, sick building syndrome, job stress, work-life balance, exhaustion, engagement, and professional isolation. The total effects of living with others/living alone on perceived productivity are found to consist entirely out of indirect effects, thus living with others does not affect perceived productivity directly. The effect of living with others on perceived productivity is mediated by the work-life balance, depression, engagement and professional isolation.

The effects of perceived organisational support on perceived productivity are found to be largely mediated by sick building syndrome, job stress, work-life balance, exhaustion, engagement, and professional isolation.

7.7 EXPLANATORY ANALYSIS

As briefly stated before, it was found that week 7's questionnaire was of a more descriptive and explanatory nature, while week 3's questionnaire was more based on scientific literature. To better interpret some of the findings in this chapter, week 7's questionnaire is used to generate descriptive analysis and gain some insight into the findings of week 3 data.

Data from week 3 and week 7 were found to be relatively similar (Table 15), and therefore it was decided that week 7 data may be used to explain the relationships which were revealed using week 3 data. Below, some findings regarding physical activity, physical, mental, and social health are discussed along with its finding and interpretation from week 7 data.

First, it was found that only 6.2% of respondents with physical, mental health problems reported calling in sick due to their health problems (Table 51).

Table 51 Question Q45180T from questionnaire week 7

Q45180T - Have you had to call in sick due to these health problems? (N=5648)	Frequency	Percentage
Yes	349	6.2%
No	5238	93.8%

7.7.1 PHYSICAL HEALTH

Descriptive research revealed a large discrepancy between weeks 3 and 7 on the number of physical health problems one suffered from. As briefly explained in Section 7.4, this difference may be attributed to how the health-problem question is stated. Week 7 data reveals that 5142 respondents (27.3% of the sample), reported experiencing one or more physical health problems.

Explanatory analysis reveals that the majority of teleworkers with physical health problems think these problems are caused by their sedentary behaviour, in which there is too little alteration between sitting and standing or walking (74.7%). This possible explanation is in line with research by Crossan & Burton (1993) and Tavares (2017), in which it was identified that teleworkers take fewer health breaks which are important for musculoskeletal relaxation. Furthermore, the emergence of physical health problems was also attributed to unsuitable furniture (63.4%) and spending too much time on screen work (64.7%), which is in line with research stating that cramped workspaces, noise, insufficient work breaks or poor ergonomics causes health and safety problems (Crossan & Burton, 1993). Some of the other possible reasons for the emergence of physical health problems that were reported include high workload and/or stress (n=17), poor work-life balance (n=18), monotonous work (n=23), and the elimination of the active commute (n=16). Getting physically ill from the COVID-19 virus is only stated four times as the explanation for experiencing physical health problems.

Table 52 Question Q45177T from questionnaire week 7

Q45177T - What do you think caused your physical health problems? (N=5142)	Frequency	Percentage
Not comfortable and/or not (sufficiently) adjustable furniture	3262	63.4%
Inadequate ICT resources	636	12.4%
Too little alternation between sitting and movement	3842	74.7%
Too much computer screen work	3326	64.7%
Other, namely …	184	3.6%

It was found that only a quarter of the sample has become more physically active since they started working from home (Table 53).

Out of the 4400 respondents who started exercising more since they started working at home, 2781 respondents stated to do so to compensate for a large amount of sitting throughout the day – which is associated with telework (Crossan & Burton, 1993; Tavares, 2017). Furthermore, the increase in physical exercise is partly due to the elimination of the (active) physical commute to the office and as teleworkers state, they have more time for it since working from home.

Table 53 Question Q45173T and Q45174T from questionnaire week 7

Q45173T - Have you started to exercise more since working at home? (N=18824)		Frequency	Percentage
	Yes	4400	23.4%
	No	14424	76.6%
Q45174T - Why did you start exercising more? (N=4400)		**Frequency**	**Percentage**
To compensate for much sitting		2781	63.2%
Because I no longer travel to work actively (walking, cycling, etc.)		1909	43.4%
Because I have more time for it now		2343	53.3%
Other, namely …		203	4.6%

7.7.2 MENTAL HEALTH

Descriptive research also revealed a large discrepancy between weeks 3 and 7 on the number of mental health problems one suffered from. Week 7 data reveals that 3,589 respondents reported experiencing one or more mental health problems.

A majority of the teleworkers with mental health problems attribute their problems to being obliged to work from home (66.6%) and feeling socially isolated (57%). This finding is in line with research by Santini et al. (2020) which indicates that social isolation and loneliness increase the risk of mental disorders, such as depression and anxiety.

Table 54 Question Q45178T from questionnaire week 7

Q45178T - What do you think caused your mental health problems? (N=3589)	Frequency	Percentage
Stress from the corona crisis in general	1197	33.4%
Worrying for my health due to COVID-19	424	11.8%
Caring for family members	668	18.6%
Having to be at home	2390	66.6%
High workload due to COVID-19	779	21.7%
Worrying about work content and continuity (because of COVID-19)	365	10.2%
Different/no work rhythm	1292	36.0%
Social isolation	2047	57.0%
Other, namely…	202	5.6%

Furthermore, stress or worry due to the COVID-19 pandemic is also stated as a common reason for suffering from mental health problems. Common alternative explanations include poor work-life balance (n=37) and monotonous work tasks (n=21).

The majority of respondents reported changes in their sleeping pattern (**Table 55**), in which 59.7% reported waking up later and 50.9% reported going to bed later. A significant part of the sample reported a decrease in sleep quality as a result of waking up more often throughout the night (26.3%), worrying more at night (9.8%) and sleeping more restlessly (21.2%).

Table 55 Question Q45171T and Q45172T from questionnaire week 7

Q45171T - Has your sleeping pattern changed since you started working at home? (N=18828)		Frequency	Percentage
	Yes	9831	52.2%
	No	8997	47.8%
Q45172T - How has your sleeping pattern changed since you started working at home? (N=9831)		**Frequency**	**Percentage**
	I am going to bed later	5008	50.9%
	I wake up later	5865	59.7%
	I sleep shorter	1824	18.6%
	I sleep longer	2694	27.4%
	I go to sleep earlier	534	5.4%
	I wake up more often in between	2588	26.3%
	I worry more at night	967	9.8%
	I sleep restlessly	2080	21.2%
	Other, namely	253	2.6%

7.7.4 SOCIAL HEALTH

Explanatory analysis of week 7's questionnaire reveals how changes in social cohesion are perceived by respondents. First, the findings regarding social cohesion, as perceived by regular employees, are discussed (Table 56). Second, the perceived social cohesion among managerial employees are discussed (Table 57).

Table 56 Changes in social cohesion according to regular employees

Agreement with the following statements on a 5-point scale from strongly disagree (1) - strongly agree (5). (N=17573)		Mean	St. Dev
Q45181T	*The content of contact with colleagues has changed now that I work at home*	3.91	0.934
Q45182T	*The frequency of contact with co-workers has changed now that I work at home*	4.19	0.783
Q45183T	*The one-to-one conversations with co-workers are more personal than before*	2.72	0.949
Q45184T	*I feel less involved with my colleagues*	3.25	1.029
Q45185T	*Now that I work at home I mainly discuss work-related topics with my colleagues*	3.47	0.978
Q45186T	*I find it more rewarding to see my colleagues in meetings from home*	3.68	0.928
Q45187T	*I seek personal contact with my colleagues and manager more often*	2.67	0.837

Respondents state that both the content and the frequency of contact with colleagues has changed drastically since working from home (Table 56). Furthermore, respondents claim that contact with colleagues has become less personal and, consequently, more work-oriented compared to before they were obliged to work from home. Similarly, it is found that respondents felt less involved with their colleagues. Conversely, it is found that respondents find it more rewarding to see their colleagues during video meetings, which may be associated with the increase of interactions with colleagues through email or messenger platforms.

These findings are in line with research by Grant et al. (2013) and Mann & Holdsworth (2003), stating that the building of relationships and maintenance of communication with colleagues is essential for the psychological well-being of teleworkers. A lack of social support among colleagues could produce several other negative emotions such as feelings of insecurity and lack of confidence in their abilities (Mann & Holdsworth, 2003). Conversely, these findings contrast research by Pierik (2011), which found that New Ways of Working (in which telework is one of the most important components) increases social cohesion. Pierik (2011) suggests that this is possibly due to increased awareness of the social effects of telework on people, resulting in a mutual focus on maintaining contact with their colleagues and team.

Managerial employees report relatively similar statements regarding social cohesion (Table 57), in which both groups state that the content and the frequency of contact with colleagues has changed strongly since starting to work from home.

Table 57 Changes in social cohesion according to managerial employees

Agreement with the following statements on a 5-point scale from strongly disagree (1) - strongly agree (5). (N=1286)		Mean	St. Dev
Q45181Ta	*The content of contact with colleagues has changed now that I work at home*	3.92	0.937
Q45182Ta	*The frequency of contact with co-workers has changed now that I work at home*	4.12	0.785
Q45183Ta	*The one-to-one conversations with co-workers are more personal than before*	2.76	0.950
Q45184Ta	*I feel less involved with my colleagues*	2.86	1.037
Q45185Ta	*Now that I work at home I mainly discuss work-related topics with my colleagues*	3.28	1.033
Q45186Ta	*I find it more rewarding to see my colleagues in meetings from home*	4.03	0.823
Q45187Ta	*I seek personal contact with my colleagues and manager more often*	2.94	0.885
Q45188Ta	*I encourage my employees to maintain informal contact with each other as well*	4.08	0.745

It was found that managerial employees feel more involved with their colleagues, and find it more rewarding to see their colleagues during video meetings compared to regular employees (

Table 58). Even though it is found that managers encourage informal contact between their employees, it is revealed that it has little effect – as they feel less involved and contact is less personal.

Table 58 Comparison of social cohesion between regular and managerial employees

Question	Regular employee Mean	Management employee Mean	t-value	Sign.
Q45181T(a)	3.91	3.92	-.723	.470
Q45182T(a)	4.19	4.12	11,970	.000
Q45183T(a)	2.72	2.76	-6,040	.000
Q45184T(a)	3.25	2.86	49,540	.000
Q45185T(a)	3.47	3.28	25,680	.000
Q45186T(a)	3.68	4.03	-49,568	.000
Q45187T(a)	2.67	2.94	-43,155	.000

Note: *N=17,342 and df=17,341*

7.8 CONCLUSION

This chapter aimed to identify significant direct and indirect relationships of personal and environmental characteristics with health aspects and perceived productivity. Furthermore, this chapter aimed to discuss the mediating role of health in the relationships between personal and environmental characteristics and perceived productivity. Last, this chapter aimed to provide possible explanations of the relationships in the path model through descriptive analysis of the week 7 dataset.

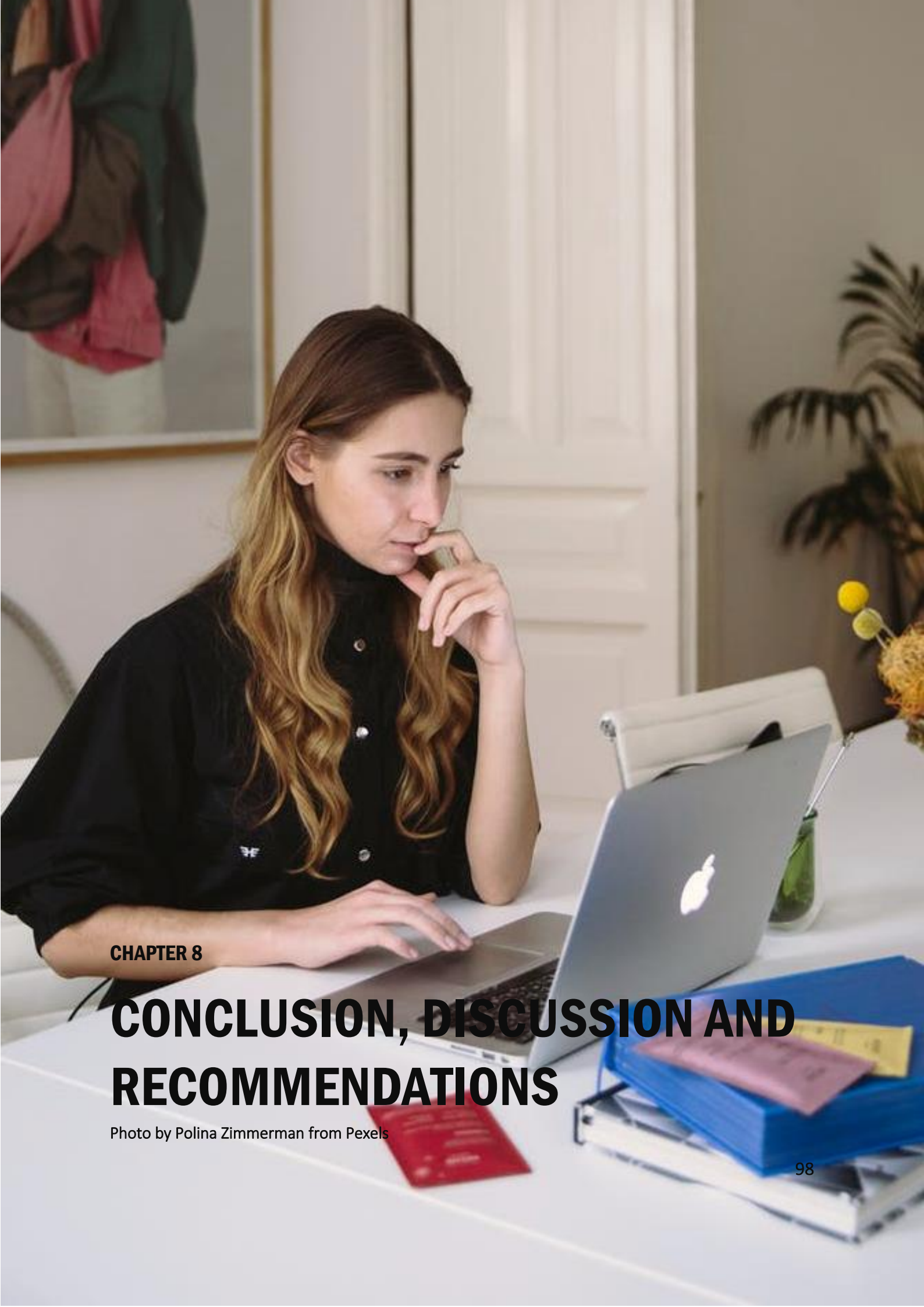
First, various significant relationships were identified between personal characteristics (gender, age, and education level), environmental characteristics (at-home workspace, children, living with others, and perceived organisational support), aspects of health (physical, mental, and social) and perceived productivity (Table 49) – which were significant at the 0.01 level. The likelihood of experiencing musculoskeletal problems was found to be largely influenced by symptoms of Sick Building Syndrome (β= 0.23), exhaustion (β= 0.14), gender (β= 0.09), professional isolation (β= 0.07), and organisational support (β= -0.07). Contrary to previous research, stating that poor musculoskeletal health is more common among older people, teleworker age was found to be negatively related to musculoskeletal health (β= -0.03) in which older teleworkers had reduced risks of poor musculoskeletal health. Furthermore, the causality between poor musculoskeletal health, SBS symptoms, and depression appeared to be contrasting previous research. The emergence of symptoms of Sick Building Syndrome was found to be related to perceived organisational support (β= -0.12), age (β= -0.11), and gender (β= 0.07). Furthermore, the furnished workspace and enclosed workspace was found to be associated with reduced risks of experiencing SBS symptoms (β= -.03; β= -0.02), which may be explained by other unidentified aspects of the at-home workspace such as indoor temperature, lighting and noise.

Job stress was found to be strongly influenced by exhaustion (β= 0.53) and professional isolation (β= 0.11). The work-life balance was also found to be strongly influenced by exhaustion (β= -0.48), as well as job stress (β= -0.13) and professional isolation (β= -0.12). The likelihood of experiencing depressive symptoms was influenced by exhaustion (β= 0.24), professional isolation (β= 0.22) and work engagement (-β= 0.17). Exhaustion was found to be affected by professional isolation (β= 0.31), symptoms of Sick Building Syndrome (β= 0.19), engagement (β= -0.18), and perceived organisational support (β= -0.14). Last, perceived organisational support was found to play the largest role in engagement (β= 0.26).

Professional isolation was found to be affected by perceived organisational support (β= -0.16), symptoms of Sick Building Syndrome (β= 0.16), and age (β= -0.08).

It was found that physical, mental, and social health aspects played the largest role in influencing perceived productivity, in which 78.8% of the total effects on perceived productivity in the model originated from aspects of health (e.g. 25% of effects from engagement and 19% from professional isolation). Furthermore, it was found that health also mediated more than half of the total effects from personal and environmental characteristics on perceived productivity.

The explanatory analysis found that the majority of teleworkers with physical health problems think these problems are caused by their sedentary behaviour, in which there is too little alteration between sitting and standing or walking (74.7%). Moreover, most of the respondents with mental health problems attribute their problems to being obliged to work from home (66.6%) and feeling socially isolated (57%). Despite the high prevalence of reported health problems, only 6.2% reported calling in sick. Contact with colleagues is found to have become less personal as a result of obliged telework.



CHAPTER 8

CONCLUSION, DISCUSSION AND RECOMMENDATIONS

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8. CONCLUSION, DISCUSSION AND RECOMMENDATIONS

The previous chapter aimed to identify the significant relationships in the path model. Furthermore, the direct and indirect relationships of personal and environmental characteristics with health aspects and perceived productivity were discussed. Lastly, mediation analysis and explanatory analysis was performed to provide possible explanations of the relationships in the path model.

This chapter aims the draw conclusions from the research and to answer the research questions. Furthermore, this chapter discusses the findings of the current study in relation to previous research, and the limitations of the study. Lastly, the implications for future research are discussed.

8.1 SUMMARY AND FINDINGS

This study aimed to identify the effects of personal characteristics and environmental factors on the health and productivity of teleworkers during the COVID-19 pandemic. To achieve this, the following sub-research questions were answered through literature review, as well as three quantitative analysis methods: descriptive analysis, bivariate analysis, and path analysis.

1) Which personal characteristics of home-based teleworkers are related to their environment, health, and productivity during the COVID-19 pandemic?

Due to the limitations of Structural Equation Modelling regarding endogenous dummy variables, this question is answered in two parts – through findings from bivariate analysis and path analysis:

First, the effects of personal characteristics of teleworkers on their physical and social environment were analysed through bivariate analysis. It is important to note that the following relationships are not controlled for the other variables in the model:

It is revealed that men are more likely to work from furnished and enclosed workspaces compared to female and non-binary teleworkers. Similarly, older teleworkers are also more likely to work from furnished and enclosed workspaces than those who are younger. Age also appears to affect household factors, in which older teleworkers were more likely to have partners. Teleworkers aged 31-40 and 41-50 years old are more likely to have children that live at home compared to other age groups. The job role is found to be associated with several household factors, as management employees are significantly more likely to have a partner and children compared to regular employees. Education is related to the at-home workspace and household factors, in which highly educated teleworkers are more likely to work from furnished and enclosed workspaces compared to those with lower levels of education. Teleworkers with primary and secondary education levels are the least likely to have children living at home.

Teleworkers that experience a decrease in workload compared to before working from home are less likely to work from furnished and enclosed workspaces compared to those with a similar or increased workload. Furthermore, teleworkers with children are more likely to experience an increased workload since working from home, compared to those without children. This finding suggests that the presence of children in the household affects the experienced workload. Working from a furnished and enclosed workspace is associated with poor sedentary behaviour and with higher levels of physical activity compared to those in non-furnished and non-enclosed workspaces.

Path analysis reveals that gender, age, and education were the only personal characteristics in the conceptual model with significant effects on physical, mental, and social health, as well as perceived productivity when controlling for all other variables in the model. When working from home, women experienced higher levels of physical ill-health compared to men, which is in line with research by Mann & Holdsworth (2003). Furthermore, teleworking women perceived themselves to be significantly more

productive compared to teleworking men. Men are found to be more likely to suffer from depressive symptoms, which is in contrast with findings by Henke et al. (2016). Findings regarding the influence of age on health are in contrast with the literature, which state that older age is characterized by the emergence of common musculoskeletal conditions including back and neck pain, and osteoarthritis WHO (2018). The current study, however, revealed that older teleworkers experience fewer musculoskeletal problems compared to those who are younger.

A significant difference between teleworkers with lower educational backgrounds and those with high educational attainment is also identified. High educational attainment is associated with reduced risks of musculoskeletal problems and increased risks of symptoms of Sick Building Syndrome (SBS), compared to those with lower educational backgrounds.

2) Which physical and social environmental characteristics of home-based teleworkers are related to their health and productivity during the COVID-19 pandemic?

When controlling for all the other variables in the path model, it is revealed that only the at-home workspace, the presence of children in the household, and whether the teleworker lived with others are significantly related to health and perceived productivity.

The physical environment of a teleworker is found to directly influence how much support from their work is experienced, their physical, mental, and social health, as well as their perceived productivity. Working from a furnished and/or workplace at home is found to be related to better physical health, improved work-life balance, reduced exhaustion, increased engagement, reduced professional isolation, and higher perceived productivity. Working from a furnished workplace is also associated with improved musculoskeletal health. These findings are consistent with previous research, as furnished and enclosed at-home workspaces are reported to be associated with reduced risks of physical ill-health (Ammons & Markham, 2004; Leesman, 2020; Nakrošiene et al., 2019; Tavares, 2017), improved work-life balance (Ammons & Markham, 2004; Thorstensson, 2020) and productivity (Nakrošiene et al., 2019; Thorstensson, 2020) compared to those working in non-furnished and non-enclosed workspaces.

Household factors and the extent to which a teleworker feels supported by their work, as part of the teleworker's social environment, are found to significantly influence teleworker health and perceived productivity. The presence of children in the household is revealed to be directly related to the physical, mental, and social health of teleworkers, as well as their perceived productivity. Teleworkers with children are found to have slightly better physical health (fewer symptoms of SBS), reduced likelihood of depressive symptoms, and increased engagement compared to those without children. However, the presence of children in the household is also associated with higher job stress, poorer work-life balance, increased exhaustion, professional isolation, and lower perceived productivity compared to those without children. These findings are partly in line with research by Golden et al. (2006) stating that when the household size of a teleworker is large there is an increased probability of work-family conflicts resulting in a reduced satisfaction with telework and reduced productivity.

Another household factor, whether a teleworker lives with others or lives alone, is found to directly affect mental and social health. Teleworkers who live alone are revealed to have a poorer work-life balance, more depressive symptoms, lower engagement and increased professional isolation compared to those living with others. These findings are partly in line with research by Ammons & Markham (2004), stating that family members or housemates may act as border-keepers for limiting workaholic tendencies by monitoring and limiting the work hours of teleworkers – thus, improving the work-life balance.

In the work-domain, it is revealed that the extent to which a teleworker feels supported by their work is significantly related to their physical, mental, and social health. As teleworkers are less visible to their supervisors, Yakovleva et al. (2010) emphasized that trust and support are very important factors for teleworking successfully. In the current research, it is discovered that those who felt supported by their work experience fewer physical health issues, reduced stress, improved work-life balance, reduced exhaustion, improved engagement, and reduced professional isolation.

High levels of support from the organisation are related to significantly lower perceived productivity. These findings are in contrast with findings by Thorstensson (2020) stating that a lack of trust and support between the organisation and the employee has a negative effect on productivity.

3) How do the physical, mental, and social health of home-based teleworkers relate to each other?

The three different aspects of health (physical, mental, and social) are found to be strongly interrelated. First, poor musculoskeletal health is found to be associated with experiencing several symptoms of SBS, as well as high job stress, exhaustion, and professional isolation. The findings of the current research regarding job stress are in line with research by Crawford et al. (2011), who revealed that musculoskeletal problems are related to psychosocial symptoms such as high work demands, low control over time, job insecurity, lack of interaction with colleagues and feeling overworked.

Second, high job stress is associated with increased risks of experiencing symptoms of SBS and increased exhaustion. Work-life balance is associated with job stress, depressive symptoms, exhaustion, engagement and professional isolation. High job stress, exhaustion and professional isolation, as well as suffering from depressive symptoms, negatively influence the work-life balance. These findings are in line with previous research discussing the relationship between the work-life balance and aspects of mental health such as stress, emotional exhaustion, anxiety, and depression (e.g. Sirgy & Lee, 2018; Sprung & Rogers, 2020). High engagement is found to negatively affect the work-life balance. This negative effect of engagement on work-life balance has not been discussed yet in other studies. Moreover, this slight negative effect may suggest that highly engaged teleworkers are more prone to overwork and have difficulty in switching off, thus negatively affecting the work-life balance.

Depressive symptoms are found to be strongly related to other aspects of mental health. Teleworkers who experienced high job stress, exhaustion, and professional isolation are more likely to suffer from multiple depressive symptoms. These findings are in line with previous research in which high levels of work engagement were found to predict lower levels of psychological health conditions such as anxiety and depression, while low exhaustion, isolation and loneliness were related to reduced risks of mental disorders, such as depression (Clays et al., 2007; Innstrand et al., 2012; Koutsimani et al., 2019; Santini et al., 2020). Depression is related to symptoms of Sick Building Syndrome, in which teleworkers with headaches were identified to have an increased likelihood of depressive symptoms. These findings concur with previous research, in which migraine headaches played an important role in increasing the incidence of depression (e.g. Lampl et al., 2016).

High emotional and mental exhaustion is found to be related to professional isolation, low organisational support and SBS symptoms. These findings are in line with previous research in which high isolation predicts increased exhaustion (Golden et al., 2008), headaches and respiratory problems were related to exhaustion (Salvagioni et al., 2017). Furthermore, a strong negative relationship was identified between work engagement and emotional exhaustion (Chen et al., 2020). Work engagement is found to also be related to symptoms of SBS, which is in line with research by Malmberg-Ceder et al. (2020) in which headaches were negatively related to work engagement.

Last, professional isolation is found to be influenced by engagement and SBS symptoms, in which low levels of engagement and experiencing symptoms of SBS are associated with increased professional isolation. Previous research revealed similar findings in which social isolation was associated with increased headache frequency and severity, and reduced work engagement (Arora, 2012; Bentein et al., 2017; Goadsby et al., 2021).

4) How are the health of home-based teleworkers and their productivity related to each other during the COVID-19 pandemic?

Path analysis reveals significant relationships between the several health aspects in the model and the perceived productivity of teleworkers. Especially aspects of mental health are found to influence perceived productivity the most.

Work engagement is found to impact perceived productivity the most (β=0.30; *p< .01*), which is in line with previous research where engagement is associated with increased employee productivity through increased job motivation and satisfaction (Hanaysha, 2016). Furthermore, professional isolation is also found to impact perceived productivity strongly (β=-0.23; *p< .01*). Research by Toscano & Zappalà (2020) revealed similar findings, (social) isolation and stress were identified to be negatively related to an individual's perception of productivity.

Depression strongly influences perceived productivity(β= -0.21; *p< .01*), which is in line with previous research regarding depression-related productivity loss (e.g. Center for Workplace Mental Health, 2021; McTernan et al., 2013). Furthermore, the work-life balance is found to play a role in the perceived productivity of teleworkers (β=0.10; *p< .01*), in which the work-life balance plays a role in a person's quality of work and job performance through reduced time spent on household tasks and reduced likelihood of work-family conflicts (e.g. Golden et al., 2006; Grant et al., 2013; Ward, 2017)

In contrast to previous research (e.g. Aboagye et al., 2019; Selekler et al., 2015), exhaustion and symptoms of SBS are both positively related to perceived productivity (both: β=0.03; *p< .01*). These findings suggest that exhaustion and symptoms of SBS are positively related to the perception of productivity, while most likely being negatively related to objective labour productivity.

Table 59 The role of teleworker health on perceived productivity

	Variable	Standardized β	Percentage of total effects	Grouped effects
Personal characteristics	Gender	0.10	8%	12.7%
	Age	0.03	3%	
	Education	0.02	2%	
Environmental characteristics	Furnished Workspace	0.01	1%	8.5%
	Enclosed Workspace	0.02	2%	
	Children	0.02	2%	
	Living with others	-	-	
	Support	0.05	4%	
Health	Musculoskeletal Problems	-	-	78.8%
	SBS Symptoms	0.03	3%	
	Occupational Stress			
	Job Stress	-	-	
	Work-life balance	0.13	11%	
	Depression Symptoms	0.21	18%	
	Exhaustion	0.03	3%	
	Engagement	0.30	25%	
	Professional Isolation	0.23	19%	
	Total standardized effects	**1.18**	**100%**	

5) To what extent do physical, mental and social health mediate the effect of personal and/or environmental characteristics on productivity?

While comparing the standardized coefficients in the path model, it is found that a large majority of the effects on the perceived productivity of teleworkers can be attributed to health (Table 59). The health aspects in the model are responsible for 78.8% of the total standardized effects on perceived productivity, while personal and environmental characteristics only account for 12.7% and 8.5% respectively.

Therefore, it is found that that physical, mental, and social health aspects play a large role as mediators in the effects of personal and environmental characteristics on perceived productivity. With an exception for the effects of gender and whether someone has children, more than half of the total effects from personal and environmental characteristics on perceived productivity were mediated by the different health aspects in the model (again, see Table 59).

6) Which perceived changes in the environment of teleworkers might explain the experienced deterioration of physical, mental and/or social health while working from home during the COVID-19 pandemic?

Explanatory analysis of the week 7 questionnaire reveals that only 23.4% of the sample have started to become more physically active since they were obliged to work from home. 63.2% of this group state that their reason for this increase in physical activity is to compensate for a large amount of time spent sitting, and 53.3% of the group reported becoming more physically active as they have more time for it now. 43.4% of this group stated that their increase in physical exercise was related to the elimination of their active commute.

The change in working environment resulted in the physical health deterioration of 27.3% of week 7's sample, as 5,142 respondents reported the emergence of one or more physical health problems in the last four weeks of working from home. 74.7% of respondents attribute their physical health problems to too little alteration between sitting and standing or walking during the workday. Previous research reports similar findings, as teleworkers were found to take fewer health breaks, which are important for musculoskeletal relaxation (Crossan & Burton, 1993; Tavares, 2017). Other explanations for physical health deterioration, such as unsuitable furniture (63.4%) and spending too much time on screenwork (64.7%) were also reported by teleworkers.

19% of the week 7 sample reported the emergence of one or more mental health problems in the last four weeks of working from home. Teleworkers attributed the deterioration of their mental health to being obliged to telework (66.6%), social isolation (57.0%), and stress as a result of the COVID-19 pandemic (33.4%). Research during the COVID-19 pandemic by Toscano & Zappalà (2020) revealed that the social isolation generated by the lack of face-to-face contact with colleagues is positively associated with stress. The findings of the current research are also closely in line with research which identified that the inability to meet with colleagues physically, and being far from the traditional office, in combination with long, continuous working hours induces feelings of loneliness and isolation (Bailey & Kurland, 2002; Grant et al., 2013; Mann & Holdsworth, 2003; Skov et al., 1996).

Explanatory analysis, related to (changes in) social cohesion, revealed that teleworkers perceived significant changes in work-related social cohesion, in which contact with colleagues has become less personal compared to before they were obliged to work from home. The findings of the current research are in line with research by Grant et al. (2013) and Mann & Holdsworth (2003), stating that maintenance of communication with colleagues during telework is difficult, but essential for the psychological well-

being of teleworkers. Thus, it is possible that teleworkers feel an increase in being socially/professionally isolated due to the changes in contact with colleagues and managers as a result of working from home.

8.2 DISCUSSION & LIMITATIONS

8.2.1 DISCUSSION

For this study, two different questionnaires as part of the 'We Work from Home" research project were used to study the influence of different personal characteristics and environmental factors, as described in Edwards & Shipp's (2012) person-environment fit framework, on health and productivity outcomes during the period of obliged home-based telework in the COVID-19 pandemic. These two questionnaires were distributed among 19 public organisations, which have a combined total of more than 61 thousand employees, resulting in a research sample of 25,058 and 18,859 valid responses.

Previous research discusses the significance of personal and environmental characteristics concerning outcomes of telework (Ammons & Markham, 2004; Bailey & Kurland, 2002; Mann & Holdsworth, 2003; Steward, 2001; Thorstensson, 2020; Troup & Rose, 2012). The current research expands upon this growing body of literature by investigating these relationships during the current exceptional circumstances of obliged, high-intensity telework, and the mediating role of teleworker health on productivity.

A significant strong influence of age was found on the mental health of teleworkers (i.e. symptoms of depression), which supports similar findings by Pieh et al. (2020) and Weitzer et al. (2021). Pieh et al. (2020) reported an especially heavy mental health burden among young Austrian adults. Similar research by Weitzer et al. (2021) found that the quality of life of younger Austrians was affected more than other age groups, both positively and negatively. It is suggested that this could potentially be explained by their higher (occupational) uncertainty and larger restrictions in their daily lives due to COVID-19 induced lockdowns (Pieh et al., 2020).

The data contributes a clearer understanding of the directionality of relationships between physical, mental and social health aspects. For example, findings concerning the directionality of the relationship between job stress and work-life balance were found to be counter-intuitive. Several arguments can be made regarding the effects of poor work-life balance on job stress: previous research revealed that the blurring of boundaries between work and home life, and distinguishing work and family roles may lead to increased feelings of frustration, anger and stress (Mann & Holdsworth, 2003). The findings of this study, however, suggest the opposite: high levels of job stress caused by telework causes overwork, the inability to switch off and reduced relaxation, which negatively affects the work-life balance.

The current research also supports theories regarding the importance of the suitability of the home office on telework outcomes (e.g. Bloom et al., 2015; Mann & Holdsworth, 2003; Nakrošiene et al., 2019; Steward, 2001; Tavares, 2017; Thorstensson, 2020). Furthermore, this research provides new insights into the relationship between characteristics of the household composition and mental and social health. Previous research discusses that, in general, non-work-related factors, such as family orientation and amount of household distractions, are most predictive of an individual's choice to work remotely (Bailey & Kurland, 2002; Huws et al., 1990). In normal circumstances, some sort of self-selection process takes place in which employees with a suitable home situation choose to telework (when also allowed to by the organisation). Conversely, in this study, also employees with unsuitable home environments were obliged to telework, resulting in a more holistic view of the relationship between the at-home environment and perceived health and productivity. Furthermore, the results from this study add to the current knowledge regarding telework intensity and its relationship with teleworker health and productivity.

Even though health was identified as having the largest effect on perceived productivity, this research emphasises the importance of a suitable physical and social homeworking environment for successful teleworking. It is recommended that the employer plays a facilitating and supporting role in fulfilling the individual needs of their teleworking employees regarding telework intensity, flexibility and the physical workplace.

8.2.2 LIMITATIONS

This study should be considered a momentary snapshot of the evolving situation of the COVID-19 pandemic, as this study was conducted during the induced COVID-pandemic lockdowns in the Netherlands. Circumstances on an individual and societal level might have affected the perception of productivity, wellbeing and several health aspects, such as stress and social isolation - therefore limiting the generalizability of the findings of the current study.

The generalizability of the results of this study may also be limited to public organisations, as the questionnaires were only distributed among public organisations. Research by Srivastava & Krishna (1992) found significant differences in job involvement and mental health between (Indian) private- and public sector employees. Conversely, Baarspul & Wilderom (2011) found during a literature review of twenty-eight studies that there are no sector differences at the individual employee level as there is no consistent pattern of evidence in support of the widespread idea that employees in public-sector organizations behave differently from those employed in private-sector contexts. Even though the sample differs from the population in some aspects, by being older, slightly more male-dominated and more highly educated compared to the Dutch labour population, the results are generalizable to a large extent to knowledge workers in the public and private sector with similar job roles.

The results and interpretations are limited by not having assessed potentially influential aspects of the physical and social working environment, as well as important aspects of physical, mental and social health. For example, no information was collected on many aspects of the physical environment such as indoor temperature, lighting, noise and privacy, which are identified by Marzban et al. (2021) as the main sources of dissatisfaction with working from home during the COVID-19 pandemic. Similarly, no objective assessment of telework satisfaction and motivation were measured – resulting in a not yet complete overview of teleworker well-being.

For the measurement of exhaustion, perceived organisational support, and several other factors non-validated measures were used. Even though Cronbach alpha measures were performed and relatively high internal consistency indicators were found, it is considered that the reliability of these measures may be slightly limited. The findings regarding productivity should be interpreted with caution as perceived productivity is not the same as objective, employer-assessed productivity. It is possible that respondents interpreted the concept of “productivity” differently respondents (i.e. busy instead of productive) since there is no reference regarding productivity. Therefore, this measure may contain several potential sources of bias (Brutus et al., 2013; Leaman & Bordass, 1999). Also, findings regarding employee mental and social health should be interpreted cautiously, as the measurement of health is a snapshot of one specific moment. Both mental health and social health can fluctuate heavily on a day-to-day, or even a minute-to-minute basis (Pan et al., 2021).

Last, the results of this research are limited by the methodological and practical limitations of Structural Equation Modelling (SEM), as the use of dichotomous variables is only allowed when they are exogenous (have no incoming arrows). For example, research by Weitzer et al. (2021) identified increased mental ill-health among teleworking women. Weitzer et al. (2021) revealed that being married or in a partnership was associated with a positive change in the quality of life in men, whereas for women the effect was the opposite. Furthermore, women who were married or in a partnership were less likely to

report an increased quality of life compared to single women. These findings suggest that women are still carrying most of the burden of childcare and household chores during the COVID-19 lockdown as found by Czymara et al. (2021), resulting in decreased mental health. In the current research's bivariate analysis, individual relationships between gender and mental health outcomes, as well as between having children and mental health outcomes were identified. However, due to the limitations of SEM, the current research cannot confirm nor deny the effect of children as a mediator on mental health outcomes such as stress, work-life balance and exhaustion while controlling for other factors.

8.3 IMPLICATIONS FOR FUTURE RESEARCH & PRACTICE

8.3.1 IMPLICATIONS FOR FURTHER RESEARCH

Future research should firstly try to overcome the limitations of the current study, as described in Section 8.2.2. For this, a similar large-scale study should take place which includes employees from both public and private organisations. The results from this study emphasize the urgency of a suitable at-home workspace as a means for successful telework. Therefore, additional characteristics of the physical at-home workspace should be measured, such as indoor air quality (IAQ), thermal comfort, lighting, and noise. Other factors that influence telework outcomes and were unidentified in the current study, such as job satisfaction, flexibility and telework intensity should also be included in future research. Furthermore, it would be beneficial to conduct research similar to the current study, while also having a control group to compare the findings with.

This research partly fills in the research gap presented by Tavares (2017) regarding the health-productivity relationship. In order to measure productivity more accurately, it is recommended to use more objective productivity measures, similar to the research by Bloom et al. (2015), compared to self-rated productivity. For this, alternative methods of measuring productivity should be identified as the measurement of productivity differs between job roles.

Finally, for future research, it is recommended to approach the data collection differently. As briefly mentioned before, an existing dataset provided by the "We Work from Home" (WWH) research project is used for this study. WWH collected data during nine consecutive weeks among Dutch office workers of different public organisations. Instead of nine questionnaires, each discussing various aspects of telework, it is recommended to create only one detailed questionnaire, which is repeatedly distributed over time to the same people. First, when the samples are statistically similar it makes it possible to analyse time effects more accurately. Second, as there is less time pressure to create multiple questionnaires, the quality of the questionnaire can be improved upon by including more influential factors on telework outcomes (such as characteristics from the physical environment and factors such as job satisfaction) and by consistently using established scales as measurement tools.

8.3.2 IMPLICATIONS FOR PRACTICE

Even though it is believed that this study provides interesting insights regarding the influence of personal and environmental factors on teleworker health and productivity, it is important to note that this study reveals only a fraction of the overall experience of obliged telework in the Netherlands during the COVID-19 pandemic. As stated in the introduction, it is revealed that occupational health plays a large role in the efficiency of an organisation and its employees and is estimated to result in an economic loss of 4–6% of GDP (WHO, 2017). Consequently, investing in workplace health initiatives can reduce this economic loss by reducing sick leave absenteeism and organisational health-care costs while improving job performance, satisfaction and motivation (Grawitch et al., 2006; Merrill et al., 2012; World Health Organisation, 2017).

The insights presented in the current study can aid organisations in their decision-making processes regarding, for example, workplace health initiatives and telework policies. Facility managers, workplace

managers, human resource managers, and regular managers can use this research to gain insights into how employees experience working from home and use this knowledge for updated policies regarding telework or increased personal attention to those struggling with working from home.

First, it is recommended that organisations incentivize or encourage healthy behaviour among office workers and teleworkers, as only a quarter of the sample reported becoming more physically active since working from home.

Second, it is highly recommended that teleworking remains a choice made by the employee. In addition to personal circumstances and characteristics, workers also vary in their personal preferences or their ability to work autonomously, therefore affecting their satisfaction with telework. Research by Bloom et al. (2015) revealed that those workers who chose to telework almost doubled their output compared to those who were simply being forced to do it. Therefore, it is suggested that the ability of the employee to choose whether to telework and how intensively, is the key to achieving health and productivity gains. This does, however, require sufficient mutual trust and support between the employee and the organisation to be successful.

Finally, it is recommended that decision-makers implement well-designed telework programs to assist employees, who wish to telework, in reducing their work-family conflict and improve their satisfaction with telework. In this research, it is revealed that teleworkers differ in many ways (including gender, household composition, health status, the physical environment and social environment) which results in different experiences regarding telework. To deal with these individual preferences, specific human resource management practices tailored to the needs of (tele)workers should be developed, as each teleworker has their own special challenges affecting their health and performance. Furthermore, such tailored policies or programs should focus on providing teleworkers with an appropriate (physical and social) working environment. The organisation should play a facilitating and supporting role in fulfilling the individual needs and preferences of their teleworking employees on aspects such as telework intensity, flexibility and the physical workplace to ensure the health and productivity gains.

REFERENCES

Aazami, S. (2015). The relationship between employees' job satisfaction and psychological/physical health: a study of Malaysian working women. *Malaysian Journal of Medical Sciences*, *22*, 40–46.

Abarghouei, M. R., Sorbi, M. H., Abarghouei, M., Bidaki, R., & Yazdanpoor, S. (2016). A study of job stress and burnout and related factors in the hospital personnel of Iran. *Electronic Physician*, *8*(7), 2625–2632. https://doi.org/10.19082/2625

Aboagye, E., Björklund, C., Gustafsson, K., Hagberg, J., Aronsson, G., Marklund, S., Leineweber, C., & Bergström, G. (2019). Exhaustion and Impaired Work Performance in the Workplace. *Journal of Occupational & Environmental Medicine*, *61*(11), e438–e444. https://doi.org/10.1097/JOM.0000000000001701

Alcover, C. M., Chambel, M. J., Fernández, J. J., & Rodríguez, F. (2018). Perceived organizational support-burnout-satisfaction relationship in workers with disabilities: The moderation of family support. *Scandinavian Journal of Psychology*, *59*(4), 451–461. https://doi.org/10.1111/sjop.12448

American Migraine Foundation. (2021). *Photophobia (Light Sensitivity) and Migraine*. https://americanmigrainefoundation.org/resource-library/photophobia-migraine/

Ammons, S. K., & Markham, W. T. (2004). Working at home: Experiences of skilled white-collar workers. *Sociological Spectrum*, *24*(2), 191–238. https://doi.org/10.1080/02732170490271744

Appel-Meulenbroek, R., Voordt, T. van der, Aussems, R., Arentze, T., & Le Blanc, P. (2020). Impact of activity-based workplaces on burnout and engagement dimensions. *Journal of Corporate Real Estate*, *22*(4), 279–296. https://doi.org/10.1108/JCRE-09-2019-0041

Arora, S. A. (2012). *Does Workplace Isolation Matter?: Examining the Impact of Workplace Isolation on Telecommuter Work Engagement*. Florida Institute of Technology. https://books.google.nl/books?id=cZ1JnwEACAAJ

Baarda, B., Bakker, E., Fischer, T., Julsing, M., van der Hulst, M., & van Vianen, R. (2012). *Basisboek Metoden en Technieken. Kwantitatief praktijkgericht onderzoek op wetenschappelijke basis*. Noordhoff Uitgevers.

Baarspul, H. C., & Wilderom, C. P. M. (2011). Do Employees Behave Differently In Public- Vs Private-Sector Organizations?: A state-of-the-art review. *Public Management Review*, *13*(7), 967–1002. https://doi.org/10.1080/14719037.2011.589614

Bailey, D. E., & Kurland, N. B. (2002). A review of telework research: Findings, new directions, and lessons for the study of modern work. In *Journal of Organizational Behavior* (Vol. 23, Issue SPEC. ISS., pp. 383–400). https://doi.org/10.1002/job.144

Baron, R. M., & Kenny, D. A. (1986). The moderator–mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*(6), 1173–1182. https://doi.org/10.1037/0022-3514.51.6.1173

BBC. (2020). *What 50 years of remote work teaches us*. BBC Worklife. https://www.bbc.com/worklife/article/20200409-how-to-work-remotely-what-the-past-50-years-teaches-us

Beauregard, T. A., Basile, K. A., & Canonico, E. (2019). Telework: Outcomes and Facilitators for Employees. In *The Cambridge Handbook of Technology and Employee Behavior*. Cambridge University Press. https://doi.org/10.1017/9781108649636.020

Bentein, K., Garcia, A., Guerrero, S., & Herrbach, O. (2017). How does social isolation in a context of dirty work increase emotional exhaustion and inhibit work engagement? A process model. *Personnel Review*, *46*(8), 1620–1634. https://doi.org/10.1108/PR-09-2016-0227

Bentley, T. A., Teo, S. T. T., McLeod, L., Tan, F., Bosua, R., & Gloet, M. (2016). The role of organisational support in teleworker wellbeing: A socio-technical systems approach. *Applied Ergonomics*, *52*, 207–215. https://doi.org/10.1016/j.apergo.2015.07.019

Besharati, A., Daneshmandi, H., Zareh, K., Fakherpour, A., & Zoaktafi, M. (2020). Work-related musculoskeletal problems and associated factors among office workers. *International Journal of Occupational Safety and Ergonomics*, *26*(3), 632–638. https://doi.org/10.1080/10803548.2018.1501238

Bloom, N., Liang, J., Roberts, J., & Ying, Z. J. (2015). Does working from home work? Evidence from a chinese experiment. *Quarterly Journal of Economics*, *130*(1), 165–218. https://doi.org/10.1093/qje/qju032

Boegheim, B. L. (2020). *Relationships between mental health and indoor environmental quality (IEQ) in the workplace at home: an explorative case study using both subjective IEQ experience and objective IEQ sensor data during the COVID-*

19 pandemic. Technische Universiteit Eindhoven.

Boles, M., Pelletier, B., & Lynch, W. (2004). The Relationship Between Health Risks and Work Productivity. *Journal of Occupational and Environmental Medicine*, *46*(7). https://doi.org/10.1097/01.jom.0000131830.45744.97

Boyd, P. C. (1997). *How to Select Telecommuters*. https://www.research-advisors.com/articles/WhoShouldTelecommute.htm

Briggs, S. R., & Cheek, J. M. (1986). The role of factor analysis in the development and evaluation of personality scales. *Journal of Personality*, *54*(1), 106–148. https://doi.org/10.1111/j.1467-6494.1986.tb00391.x

Brough, P., Timms, C., O'Driscoll, M. P., Kalliath, T., Siu, O., Sit, C., & Lo, D. (2014). Work–life balance: a longitudinal evaluation of a new measure across Australia and New Zealand workers. *The International Journal of Human Resource Management*, *25*(19), 2724–2744. https://doi.org/https://doi.org/10.1080/09585192.2014.899262

Brutus, S., Aguinis, H., & Wassmer, U. (2013). Self-Reported Limitations and Future Directions in Scholarly Reports. *Journal of Management*, *39*(1), 48–75. https://doi.org/10.1177/0149206312455245

Byrne, B. M. (1998). Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications, and programming. In *Structural equation modeling with LISREL, PRELIS, and SIMPLIS: Basic concepts, applications, and programming.* Lawrence Erlbaum Associates Publishers.

Camfil. (2020). *What is Sick Building Syndrome and why should you care?* https://www.camfil.com/nl-nl/insights/commerciële-en-openbare-gebouwen/what-is-sick-building-syndrome

Capterra. (2020). *Onderzoek thuiswerken wereldwijd – 55% denkt dat hun organisatie goed kan functioneren met permanent thuiswerkend personeel*. https://www.capterra.nl/blog/1516/wereldwijd-onderzoek-thuiswerken-capterra

Castien, R., & De Hertogh, W. (2019). A Neuroscience Perspective of Physical Treatment of Headache and Neck Pain. *Frontiers in Neurology*, *10*. https://doi.org/10.3389/fneur.2019.00276

CBS. (2011). Transseksuelen in Nederland. *Centraal Bureau Voor Statistiek*.

CBS. (2019). *Opleidingsniveau*. https://www.cbs.nl/nl-nl/nieuws/2019/33/verschil-levensverwachting-hoog-en-laagopgeleid-groeit/opleidingsniveau

CBS. (2020a). *Bevolking; geslacht, leeftijd en burgerlijke staat, 1 januari*. https://opendata.cbs.nl/statline/#/CBS/nl/dataset/7461BEV/table?fromstatweb

CBS. (2020b). *Bevolking; onderwijsniveau; geslacht, leeftijd en migratieachtergrond*. https://opendata.cbs.nl/statline/#/CBS/nl/dataset/82275NED/table?fromstatweb

CBS. (2020c). *Bijna 4 op de 10 werkenden werkten vorig jaar thuis*. https://www.cbs.nl/nl-nl/nieuws/2020/15/bijna-4-op-de-10-werkenden-werkten-vorig-jaar-thuis

CBS. (2020d). *ICT workers at home most often during coronavirus crisis*. https://www.cbs.nl/en-gb/news/2020/33/ict-workers-at-home-most-often-during-coronavirus-crisis

CBS. (2021). *Werkzame beroepsbevolking; thuiswerken*. https://opendata.cbs.nl/#/CBS/nl/dataset/83258NED/table?searchKeywords=thuiswerken

Center for Workplace Mental Health. (2021). *Depression*. http://workplacementalhealth.org/Mental-Health-Topics/Depression

Centers for Disease Control and Prevention. (2020). *Work-related Musculoskeletal Disorders & Ergonomics*. https://www.cdc.gov/workplacehealthpromotion/health-strategies/musculoskeletal-disorders/index.html#:~:text=Musculoskeletal disorders (MSD) are injuries,to the condition%3B and%2For

Chen, H., Richard, O. C., Dorian Boncoeur, O., & Ford, D. L. (2020). Work engagement, emotional exhaustion, and counterproductive work behavior. *Journal of Business Research*, *114*, 30–41. https://doi.org/https://doi.org/10.1016/j.jbusres.2020.03.025

Clays, E., De Bacquer, D., Leynen, F., Kornitzer, M., Kittel, F., & De Backer, G. (2007). Job stress and depression symptoms in middle-aged workers—prospective results from the Belstress study. *Scandinavian Journal of Work, Environment & Health*, *33*(4), 252–259. https://doi.org/10.5271/sjweh.1140

Clements-Croome, D. J. (2000). *Creating the Productive Workplace* (Issue January). E & FN Spon.

Colenberg, S., Appel-Meulenbroek, R., Romero Herrera, N., & Keyson, D. (2020). Conceptualizing social well-being in activity-based offices. *Journal of Managerial Psychology*. https://doi.org/10.1108/JMP-09-2019-0529

Colenberg, S., Jylhä, T., & Arkesteijn, M. (2021). The relationship between interior office space and employee health and well-being – a literature review. *Building Research & Information*, *49*(3), 352–366. https://doi.org/10.1080/09613218.2019.1710098

Commonwealth of Massachusetts. (2020). *Telework Suitability Guide*. https://www.mass.gov/guides/telework-suitability-guide

Cooper, C. D., & Kurland, N. B. (2002). Telecommuting, professional isolation, and employee development in public and private organizations. *Journal of Organizational Behavior*, *23*(SPEC. ISS.), 511–532. https://doi.org/10.1002/job.145

Crawford, J. O., MacCalman, L., & Jackson, C. A. (2011). The health and well-being of remote and mobile workers. *Occupational Medicine*, *61*(6), 385–394. https://doi.org/10.1093/occmed/kqr071

Crossan, G., & Burton, P. F. (1993). Teleworking stereotypes: A case study. *Journal of Information Science*, *19*(5), 349–362. https://doi.org/10.1177/016555159301900503

Czymara, C. S., Langenkamp, A., & Cano, T. (2021). Cause for concerns: gender inequality in experiencing the COVID-19 lockdown in Germany. *European Societies*, *23*(sup1), S68–S81. https://doi.org/10.1080/14616696.2020.1808692

Daniels, K., Lamond, D., & Standen, P. (1997). *Telework: Issues and Prospects*. https://www.researchgate.net/publication/236111502_Telework_Issues_and_Prospects

Danish, R., Ramzan, S., & Ahmad, F. (2013). Effect of Perceived Organizational Support and Work Environment on Organizational Commitment; Mediating Role of Self-Monitoring. *Advances in Economics and Business*, *1*, 312–317. https://doi.org/10.13189/aeb.2013.010402

De Been, I., Van der Voordt, T., & Haynes, B. (2017). Chapter 9: Productivity. In P. A. Jensen & T. van der Voordt (Eds.), *Facilities Management and Corporate Real Estate Management as Value Drivers. How to Manage and Measure Adding Value* (1st ed., pp. 140–144). Routledge/Taylor & Francis group, London/New York. https://www.routledge.com/Facilities-Management-and-Corporate-Real-Estate-Management-as-Value-Drivers/Jensen-Voordt/p/book/9780367736880

de Jong, P. F. (1999). Hierarchical regression analysis in structural equation modeling. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(2), 198–211. https://doi.org/10.1080/10705519909540128

de Paiva, C. S. (2017). Effects of Aging in Dry Eye. *International Ophthalmology Clinics*, *57*(2), 47–64. https://doi.org/10.1097/IIO.0000000000000170

Demerouti, E., Mostert, K., & Bakker, A. B. (2010). Burnout and work engagement: A thorough investigation of the independency of both constructs. *Journal of Occupational Health Psychology*, *15*(3), 209–222. https://doi.org/10.1037/a0019408

Duque, L., Costa, R., Dias, Á., Pereira, L., Santos, J., & Ant, N. (2020). *New Ways of Working and the Physical Environment to Improve Employee Engagement*. *iii*, 1–18.

Durlak, J. A. (2009). How to Select, Calculate, and Interpret Effect Sizes. *Journal of Pediatric Psychology*, *34*(9), 917–928. https://doi.org/10.1093/jpepsy/jsp004

Earle, H. A. (2003). Building a workplace of choice: Using the work environment to attract and retain top talent. *Journal of Facilities Management*, *2*(3). https://doi.org/10.1108/14725960410808230

Edwards, J. R., & Shipp, A. J. (2012). Perspectives on organizational fit. In D. M. Cable (Ed.), *Perspectives on Organizational Fit* (pp. 209–258). Jossey-Bass. https://doi.org/10.4324/9780203810026

Elsbach, K. D. (2003). Relating Physical Environment to Self-Categorizations: Identity Threat and Affirmation in a Non-Territorial Office Space. *Administrative Science Quarterly*, *48*(4), 622. https://doi.org/10.2307/3556639

Eurofound. (2020). *Telework and ICT-based mobile work: Flexible working in the digital age*. http://eurofound.link/efs009

Fairweather, N. B. (1999). Surveillance in Employment: The Case of Teleworking. *Journal of Business Ethics*, *22*, 39–49. https://doi.org/10.1023/A:1006104017646

Felstead, A., & Henseke, G. (2017). Assessing the growth of remote working and its consequences for effort, well-being and work-life balance. *New Technology, Work and Employment*, *32*(3), 195–212. https://doi.org/https://doi.org/10.1111/ntwe.12097

Field, A. (2013). *Discovering Statistics Using IBM SPSS Statistics*. Sage Publications Ltd.

Fink, G. (2009). Stress: Definition and History. In *Encyclopedia of Neuroscience* (Issue 9, pp. 549–555). Oxford: Academic

Press. https://doi.org/10.1016/C2009-1-03742-3

Finney, S. ., & DiStefano, C. (2006). Non-normal and Categorical data in structural equation modeling. In G. r. Hancock & R. O. Mueller (Hrsg.). Struc- tural equation modeling: a second course (S. 269–314). Greenwich, Connecti- cut: Information Age Publishing. *Structural Equation Modeling: A Second Course*, 269–314.

Furnham, A., & Boo, H. C. (2011). A literature review of the anchoring effect. *The Journal of Socio-Economics*, *40*(1), 35–42. https://doi.org/10.1016/j.socec.2010.10.008

Gajendran, R. S., & Harrison, D. A. (2007). The Good, the Bad, and the Unknown About Telecommuting: Meta-Analysis of Psychological Mediators and Individual Consequences. *Journal of Applied Psychology*, *92*(6), 1524–1541. https://doi.org/10.1037/0021-9010.92.6.1524

Githinji, F., & Wekesa, S. (2017). The Influence of Social Environment on Employees' Work Life Balance in the Insurance Industry. *IOSR Journal Of Humanities And Social Science*, *22*(5), 15–20. https://doi.org/10.9790/0837-2205051520

Global Workplace Analytics. (2020). *Work-At-Home After Covid-19—Our Forecast*. https://globalworkplaceanalytics.com/work-at-home-after-covid-19-our-forecast

Goadsby, P. J., Lantéri-Minet, M., Michel, M. C., Peres, M., Shibata, M., Straube, A., Wijeratne, T., Ebel-Bitoun, C., Constantin, L., & Hitier, S. (2021). 21st century headache: mapping new territory. *The Journal of Headache and Pain*, *22*(1), 19. https://doi.org/10.1186/s10194-021-01233-7

Golden, T. D., & Gajendran, R. S. (2019). Unpacking the Role of a Telecommuter's Job in Their Performance: Examining Job Complexity, Problem Solving, Interdependence, and Social Support. *Journal of Business and Psychology*, *34*(1), 55–69. https://doi.org/10.1007/s10869-018-9530-4

Golden, T. D., Veiga, J. F., & Dino, R. N. (2008). The Impact of Professional Isolation on Teleworker Job Performance and Turnover Intentions: Does Time Spent Teleworking, Interacting Face-to-Face, or Having Access to Communication-Enhancing Technology Matter? *Journal of Applied Psychology*, *93*(6), 1412–1421. https://doi.org/10.1037/a0012722

Golden, T. D., Veiga, J. F., & Simsek, Z. (2006). Telecommuting's differential impact on work-family conflict: Is there no place like home? *Journal of Applied Psychology*, *91*(6), 1340–1350. https://doi.org/10.1037/0021-9010.91.6.1340

Grant, C. A., Wallace, L. M., & Spurgeon, P. C. (2013). An exploration of the psychological factors affecting remote e-worker's job effectiveness, well-being and work-life balance. *Employee Relations*, *35*(5), 527–546. https://doi.org/10.1108/ER-08-2012-0059

Grant, K. A. (1985). How Practical Is Teleworking? *Canadian Datasystems*, *17*(8).

Grawitch, M. J., Gottschalk, M., & Munz, D. C. (2006). The path to a healthy workplace: A critical review linking healthy workplace practices, employee well-being, and organizational improvements. In *Consulting Psychology Journal* (Vol. 58, Issue 3, pp. 129–147). https://doi.org/10.1037/1065-9293.58.3.129

Gray, M., Hodson, N., & Gordon, G. (1993). *Teleworking Explained*. Wiley.

Gregg, P., & Wadsworth, J. (1999). *The state of working Britain*. Manchester University Press.

Guimaraes, T., & Dallow, P. (1999). Empirically testing the benefits, problems, and success factors for telecommuting programmes. *European Journal of Information Systems*, *8*, 40–54. https://doi.org/https://doi.org/10.1057/palgrave.ejis.3000317

Haapakangas, A., Hallman, D. M., Mathiassen, S. E., & Jahncke, H. (2018). Self-rated productivity and employee well-being in activity-based offices: The role of environmental perceptions and workspace use. *Building and Environment*, *145*, 115–124. https://doi.org/10.1016/j.buildenv.2018.09.017

Haddon, L., & Brynin, M. (2005). The character of telework and the characteristics of teleworkers. *New Technology, Work and Employment*, *20*(1), 34–46. https://doi.org/10.1111/j.1468-005X.2005.00142.x

Hämmig, O. (2019). Health risks associated with social isolation in general and in young, middle and old age. *PLOS ONE*, *14*(7), e0219663. https://doi.org/10.1371/journal.pone.0219663

Hanaysha, J. (2016). Improving employee productivity through work engagement: Evidence from higher education sector. *Management Science Letters*, *6*, 61–70. https://doi.org/10.5267/j.msl.2015.11.006

Haynes, B. P. (2007). An evaluation of office productivity measurement. *Journal of Corporate Real Estate*, *9*(3), 144–155.

Henke, R. M., Benevent, R., Schulte, P., Rinehart, C., Crighton, K. A., & Corcoran, M. (2016). The effects of telecommuting intensity on employee health. *American Journal of Health Promotion*, *30*(8), 604–612.

https://doi.org/10.4278/ajhp.141027-QUAN-544

Hobbs, D., & Armstrong, J. (1998). An experimental study of social and psychological aspects of teleworking. *Facilities*, *16*(12–13), 366–371. https://doi.org/10.1108/02632779810235744

Hoornweg, N., Peters, P., & Van Der Heijden, B. (2016). Finding the optimal mix between telework and office hours to enhance employee productivity: A study into the relationship between telework intensity and individual productivity, with mediation of intrinsic motivation and moderation of office hours. *Advanced Series in Management*, *16*, 1–28. https://doi.org/10.1108/S1877-636120160000016002

Horst, D. J., Broday, E. E., Bondarick, R., Filippe Serpe, L., & Pilatti, A. (2014). Quality of Working Life and Productivity : An Overview of the Conceptual Framework. *International Journal of Managerial Studies and Research*, *2*(87), 2349–330.

Hsu, H. C. (2019). Age differences in work stress, exhaustion, well-being, and related factors from an ecological perspective. *International Journal of Environmental Research and Public Health*, *16*(1). https://doi.org/10.3390/ijerph16010050

Hu, L., & Bentler, P. M. (1999). Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal*, *6*(1), 1–55. https://doi.org/10.1080/10705519909540118

Hulzebosch, M., Jonkhart, H., & van der Maarl, S. (2017). *Een doorkijk in het personeelsbestand van het Rijk Wat vertellen de cijfers ?*

Huws, U., Korte, W. B., & Robinson, S. (1990). *Telework: Towards the Elusive Office: Vol. John Wiley* (Informatio). Wiley.

Innstrand, S. T., Langballe, E. M., & Falkum, E. (2012). A Longitudinal Study of the Relationship between Work Engagement and Symptoms of Anxiety and Depression. *Stress and Health*, *28*(1), 1–10. https://doi.org/10.1002/smi.1395

Intermediair, & Nationale Vacaturebank. (2020). *Helft Nederlanders wil blijven thuiswerken, maar focus blijft lastig met kinderen thuis*. https://www.intermediair.nl/werk-privebalans/rolverdeling/helft-nederlanders-wil-blijven-thuiswerken-maar-hoe-concentreer-je-je-als-je-kinderen-hebt

James, L. R., & Brett, J. M. (1984). Mediators, moderators, and tests for mediation. *Journal of Applied Psychology*, *69*(2), 307–321. https://doi.org/10.1037/0021-9010.69.2.307

Jensen, P. A., & van der Voordt, T. (2020). Productivity as a value parameter for FM and CREM. *Facilities*, *39*(5–6), 305–320. https://doi.org/10.1108/F-04-2020-0038

Joint Research Centre. (2020). *Telework in the EU before and after the COVID-19 : where we were , where we head to Which workers were already teleworking in the*. https://ec.europa.eu/jrc/sites/jrcsh/files/jrc120945_policy_brief_-_covid_and_telework_final.pdf

Jones, A. P. (1999). Indoor air quality and health. *Atmospheric Environment*, *33*(28), 4535–4564. https://doi.org/10.1016/S1352-2310(99)00272-1

Joshi, S. (2008). The sick building syndrome. *Indian Journal of Occupational and Environmental Medicine*, *12*(2), 61. https://doi.org/10.4103/0019-5278.43262

Judd, C. M., & Kenny, D. A. (1981). Process Analysis. *Evaluation Review*, *5*(5), 602–619. https://doi.org/10.1177/0193841X8100500502

Kalliath, T., & Brough, P. (2008). Work–life balance: A review of the meaning of the balance construct. *Journal of Management & Organization*, *14*(3), 323–327. https://doi.org/10.5172/jmo.837.14.3.323

Kennisinstituut voor Mobiliteitsbeleid. (2020). *Thuiswerken en de coronacrisis*. https://www.kimnet.nl/publicaties/rapporten/2020/08/31/thuiswerken-en-de-coronacrisis

Kenny, D. A. (2018). *Mediation*. http://davidakenny.net/cm/mediate.htm#REF

Kenny, D. A., Kashy, D., & Bolger, N. (1998). Data analysis in social psychology. In D. Gilbert, S. Fiske, & G. Lindzey (Eds.), *Handbook of Social Psychology* (4th ed., pp. 233–265). McGraw-Hill College.

Keyes, C. L. M. (1998). Social Well-Being. *Social Psychology Quarterly*, *61*(2), 121–140.

Koppes, L. L. J., de Vroome, E. M. M., Mol, M. E. M., Janssen, B. J. M., & van den Bossche, S. N. J. (2010). *Nationale Enquete Arbeidsomstandigheden: Methodologie en globale resultaten*. https://kennisopenbaarbestuur.nl/media/234048/Nationale-enquete-arbeidsomstandigheden_Methodologie-en-globale-resultaten.pdf

Kossek, E. E., Lautsch, B. A., & Eaton, S. C. (2006). Telecommuting, control, and boundary management: Correlates of policy use and practice, job control, and work-family effectiveness. *Journal of Vocational Behavior*, *68*(2), 347–367. https://doi.org/10.1016/j.jvb.2005.07.002

Koutsimani, P., Montgomery, A., & Georganta, K. (2019). The Relationship Between Burnout, Depression, and Anxiety: A Systematic Review and Meta-Analysis. *Frontiers in Psychology*, *10*. https://doi.org/10.3389/fpsyg.2019.00284

Kristof-Brown, A., Zimmerman, R., & Johnson, E. (2005). Consequences of Individual's Fit at Work: A Meta-Analysis of Person-Job, Person-Organization, Person-Group, and Person-Supervisor Fit. *Personnel Psychology*, *58*, 281–342. https://doi.org/10.1111/j.1744-6570.2005.00672.x

Kröll, C., & Nüesch, S. (2019). The effects of flexible work practices on employee attitudes: evidence from a large-scale panel study in Germany. *International Journal of Human Resource Management*, *30*(9), 1505–1525. https://doi.org/10.1080/09585192.2017.1289548

Kromydas, T. (2020). *Educational Attainment and Gender Differences in Work – Life Balance for Couples across Europe : A Contextual Perspective*. *8*(4), 8–22. https://doi.org/10.17645/si.v8i4.2920

Kurland, N. B., & Bailey, D. E. (1999). Telework: The advantages and challenges of working here, there, anywhere, and anytime. *Organizational Dynamics*, *28*(2), 53–68. https://doi.org/https://doi.org/10.1016/S0090-2616(00)80016-9

Kyzlinková, R., & Svobodová, K. (2007). Gender differences in reasons for working from home. In *European Foundation for the Improvement of Living and Working Conditions*. http://library1.nida.ac.th/termpaper6/sd/2554/19755.pdf

Lampl, C., Thomas, H., Tassorelli, C., Katsarava, Z., Laínez, J. M., Lantéri-Minet, M., Rastenyte, D., Ruiz de la Torre, E., Stovner, L. J., Andrée, C., & Steiner, T. J. (2016). Headache, depression and anxiety: associations in the Eurolight project. *The Journal of Headache and Pain*, *17*(1), 59. https://doi.org/10.1186/s10194-016-0649-2

Le, H., Tfelt-Hansen, P., Skytthe, A., Kyvik, K. O., & Olesen, J. (2011). Association between migraine, lifestyle and socioeconomic factors: a population-based cross-sectional study. *The Journal of Headache and Pain*, *12*(2), 157–172. https://doi.org/10.1007/s10194-011-0321-9

Leaman, A., & Bordass, B. (1999). Productivity in buildings: the 'killer' variables. *Building Research & Information*, *27*(1), 4–19. https://doi.org/10.1080/096132199369615

Leesman. (2020). *Your workplace of the future - All you need to know to plan your future workplace strategy*. https://www.leesmanindex.com/your-workplace-of-the-future/?mc_cid=a532e1e4b3&mc_eid=7cc6e4491d

Lleras, C. (2005). Path Analysis. In *Encyclopedia of Social Measurement* (pp. 25–30). Elsevier. https://doi.org/10.1016/B0-12-369398-5/00483-7

López-Igual, P., & Rodríguez-Modroño, P. (2020). Who is teleworking and where from? Exploring the main determinants of telework in Europe. *Sustainability (Switzerland)*, *12*(21), 1–15. https://doi.org/10.3390/su12218797

Lunau, T., Siegrist, J., Dragano, N., & Wahrendorf, M. (2015). The Association between Education and Work Stress: Does the Policy Context Matter? *PLOS ONE*, *10*(3), e0121573. https://doi.org/10.1371/journal.pone.0121573

Madsen, S. R. (2003). The effects of home-based teleworking on work-family conflict. *Human Resource Development Quarterly*, *14*(1), 35–58. https://doi.org/10.1002/hrdq.1049

Mahmood, A., Zamir, S., Qurat-ul-Ain, Nudrat, S., & Zahoor, F. (2013). Impact of age and level of experience on occupational stress of academic managers at higher educational level. *Mediterranean Journal of Social Sciences*, *4*(1), 535–541. https://doi.org/10.5901/mjss.2012.v4n1p535

Malmberg-Ceder, K., Vuorio, T., Korhonen, P. E., Kautiainen, H., Soinila, S., & Haanpää, M. (2020). The Impact of Self-Reported Recurrent Headache on Absenteeism and Presenteeism at Work Among Finnish Municipal Female Employees. *Journal of Pain Research*, *13*, 2135–2142. https://doi.org/10.2147/JPR.S246034

Mann, S., & Holdsworth, L. (2003). The psychological impact of teleworking: stress, emotions and health. *New Technology,Work and Employment*, *18*(3), 196–211. https://doi.org/10.1111/1468-005X.

Mann, S., Varey, R., & Button, W. (2000). An exploration of the emotional impact of tele-working via computer-mediated communication. *Journal of Managerial Psychology*, *15*(7), 668–690. https://doi.org/10.1108/02683940010378054

Manukjan, A. (2012). *Telewerken & Werkplezier*.

Marcus, M., Yasamy, M. T., Ommeren, M. van, Chisholm, D., & Saxena, S. (2012). *Depression: A Global Public Health Concern*. https://www.who.int/mental_health/management/depression/who_paper_depression_wfmh_2012.pdf

Marzban, S., Durakovic, I., & Candido, C. (2021). *Working from home during COVID-19 induced lockdowns: results from Australian workers and organisations*. 1–12.

Maslach, C., Schaufeli, W. B., & Leiter, M. P. (2001). Job Burnout. *Annual Review of Psychology*, *52*(1), 397–422. https://doi.org/10.1146/annurev.psych.52.1.397

McTernan, W. P., Dollard, M. F., & LaMontagne, A. D. (2013). Depression in the workplace: An economic cost analysis of depression-related productivity loss attributable to job strain and bullying. *Work & Stress*, *27*(4), 321–338. https://doi.org/10.1080/02678373.2013.846948

Merrill, R. M., Aldana, S. G., Pope, J. E., Anderson, D. R., Coberley, C. R., & Whitmer, and the HERO Research Stud, R. W. (2012). Presenteeism According to Healthy Behaviors, Physical Health, and Work Environment. *Population Health Management*, *15*(5), 293–301. https://doi.org/10.1089/pop.2012.0003

Mesimo-ogunsanya, E. A. (2017). *Organizational Support and Employees ' Work-Life Quality*.

Mishra, P., & Bharti, V. (2020). Impact of Perceived Organizational Support on Work Life Balance during Covid-19 Era. *International Journal of Management*, *11*(12), 1602–1610. https://doi.org/10.34218/IJM.11.12.2020.146

Mitchell, R. J., & Bates, P. (2011). Measuring health-related productivity loss. *Population Health Management*, *14*(2), 93–98. https://doi.org/10.1089/pop.2010.0014

Mokhtarian, P. L., Bagley, M. N., & Salomon, I. (1998). The impact of gender, occupation, and presence of children on telecommuting motivations and constraints. *Journal of the American Society for Information Science*, *49*(12), 1115–1134. https://doi.org/10.1002/(SICI)1097-4571(1998)49:12<1115::AID-ASI7>3.0.CO;2-Y

Moore, J. E. (2000). One Road to Turnover: An Examination of Work Exhaustion in Technology Professionals. *MIS Quarterly*, *24*(1), 141. https://doi.org/10.2307/3250982

Nakrošiene, A., Buciuniene, I., & Goštautaitė, B. (2019). Working from home: characteristics and outcomes of telework. *International Journal of Manpower*, *40*(1), 87–101. https://doi.org/10.13140/RG.2.2.11064.08961

Nathania, N. V. (2015). *The Effects of New Ways of Working in Creative Industries of Developing* (Issue June 2015).

National Cancer Institute. (2020). *Physical Activity and Cancer*. https://www.cancer.gov/about-cancer/causes-prevention/risk/obesity/physical-activity-fact-sheet#:~:text=Exercise has many biological effects,20) %5Bbreast%2C colon%5D

National Institute for Occupational Safety and Health. (1999). Stress at work. In *No. 99-101* (Vol. 5, Issue 3). https://doi.org/10.1177/105256298000500315

Ng, T. W. H., & Feldman, D. C. (2009). How broadly does education contribute to job performance? *Personnel Psychology*, *62*(1), 89–134. https://doi.org/10.1111/j.1744-6570.2008.01130.x

Ng, T. W. H., & Feldman, D. C. (2013). Does longer job tenure help or hinder job performance? *Journal of Vocational Behavior*, *83*(3), 305–314. https://doi.org/10.1016/j.jvb.2013.06.012

NRC. (2020). *De toekomst van thuiswerken*.

Oakman, J., Kinsman, N., Stuckey, R., Graham, M., & Weale, V. (2020). A rapid review of mental and physical health effects of working at home: how do we optimise health? *BMC Public Health*, *20*(1), 1–13. https://doi.org/10.1186/s12889-020-09875-z

Office of Real Property. (1999). *Workplace Evaluation Study: Introducing the Cost Per Person Model*.

Olkin, I., & Sampson, A. R. (2001). Multivariate Analysis: Overview. In *International Encyclopedia of the Social & Behavioral Sciences* (pp. 10240–10247). Elsevier. https://doi.org/10.1016/B0-08-043076-7/00472-1

Olson, M. H., & Primps, S. B. (1984). Working at Home with Computers: Work and Nonwork Issues. *Journal of Social Issues*, *40*(3). https://doi.org/10.1111/j.1540-4560.1984.tb00194.x

Online, Or. (2020). *Het nieuwe thuiswerken na corona*.

Pallant, J. (2001). SPSS survival manual : a step by step guide to data analysis using SPSS for Windows. *Behaviour Change*, *18*, 58–62.

Palumbo, R. (2020). Let me go to the office! An investigation into the side effects of working from home on work-life balance. *International Journal of Public Sector Management*, *33*(6–7), 771–790. https://doi.org/10.1108/IJPSM-06-2020-0150

Pan, K.-Y., Kok, A. A. L., Eikelenboom, M., Horsfall, M., Jörg, F., Luteijn, R. A., Rhebergen, D., Oppen, P. van, Giltay, E. J., & Penninx, B. W. J. H. (2021). The mental health impact of the COVID-19 pandemic on people with and without depressive, anxiety, or obsessive-compulsive disorders: a longitudinal study of three Dutch case-control cohorts. *The Lancet Psychiatry*, *8*(2), 121–129. https://doi.org/10.1016/S2215-0366(20)30491-0

Parker, S. K., Knight, C., & Keller, A. (2020). *Remote Managers Are Having Trust Issues*. http://library1.nida.ac.th/termpaper6/sd/2554/19755.pdf

Phelps, N. (1985). *Mountain bell: Programme for managers* (pp. 33–37). https://www.nap.edu/read/168/chapter/8#35

Pieh, C., Budimir, S., & Probst, T. (2020). The effect of age, gender, income, work, and physical activity on mental health during coronavirus disease (COVID-19) lockdown in Austria. *Journal of Psychosomatic Research*, *136*, 110186. https://doi.org/10.1016/j.jpsychores.2020.110186

Pierik, L. (2011). *The Effects of New Ways of Working* [University of Twente]. http://essay.utwente.nl/62939/1/Final_version_Master_Thesis_LPierik.pdf

Posel, D. (2021). Living alone and depression in a developing country context: Longitudinal evidence from South Africa. *SSM - Population Health*, *14*, 100800. https://doi.org/10.1016/j.ssmph.2021.100800

Price, P., Jhangiani, R., & Chiang, I. (2015). Reliability and Validity of Measurement. In *Research Methods in Psychology* (2nd Canadi, pp. 96–102). BCCampus. http://www.saylor.org/site/textbooks/Research Methods in Psychology.pdf

Rathert, C., Williams, E. S., Lawrence, E. R., & Halbesleben, J. R. B. (2012). Emotional exhaustion and workarounds in acute care: Cross sectional tests of a theoretical framework. *International Journal of Nursing Studies*, *49*(8), 969–977. https://doi.org/10.1016/j.ijnurstu.2012.02.011

Rauschenbach, C., Krumm, S., Thielgen, M., & Hertel, G. (2013). Age and work-related stress: a review and meta-analysis. *Journal of Managerial Psychology*, *28*(7/8), 781–804. https://doi.org/10.1108/JMP-07-2013-0251

Redman, T., Hamilton, P., Malloch, H., & Kleymann, B. (2011). Working here makes me sick! The consequences of sick building syndrome. *Human Resource Management Journal*, *21*(1), 14–27. https://doi.org/10.1111/j.1748-8583.2010.00155.x

Robblee, J., & Singh, R. H. (2020). Headache in the Older Population: Causes, Diagnoses, and Treatments. *Current Pain and Headache Reports*, *24*(7), 34. https://doi.org/10.1007/s11916-020-00866-8

Salvagioni, D. A. J., Melanda, F. N., Mesas, A. E., González, A. D., Gabani, F. L., & Andrade, S. M. de. (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

Santini, Z. I., Jose, P. E., York Cornwell, E., Koyanagi, A., Nielsen, L., Hinrichsen, C., Meilstrup, C., Madsen, K. R., & Koushede, V. (2020). Social disconnectedness, perceived isolation, and symptoms of depression and anxiety among older Americans (NSHAP): a longitudinal mediation analysis. *The Lancet Public Health*, *5*(1), e62–e70. https://doi.org/10.1016/S2468-2667(19)30230-0

Sardeshmukh, S. R., Sharma, D., & Golden, T. D. (2012). Impact of telework on exhaustion and job engagement: A job demands and job resources model. *New Technology, Work and Employment*, *27*(3), 193–207. https://doi.org/10.1111/j.1468-005X.2012.00284.x

Schaufeli, W. B., & Bakker, A. B. (2004a). Utrecht work engagement scale Preliminary Manual Version 1.1. *Occupational Health Psychology Unit Utrecht University*, *December*, 1–60. https://doi.org/10.1037/t01350-000

Schaufeli, W. B., & Bakker, A. E. (2004b). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *Journal of Organizational Behavior*, *25*(3), 293–315. https://doi.org/10.1002/job.248

Schumacker, R. E., & Lomax, R. G. (2010). A Beginner's Guide to Structural Equation Modeling, 3rd edn. In *Journal of the Royal Statistical Society: Series A (Statistics in Society)* (Vol. 175, Issue 3). Routledge Academic. https://doi.org/10.1111/j.1467-985x.2012.01045_12.x

Schwartz, B. S. (1998). Epidemiology of Tension-Type Headache. *JAMA*, *279*(5), 381. https://doi.org/10.1001/jama.279.5.381

Selekler, H. M., Gökmen, G., Alvur, T. M., & Steiner, T. J. (2015). Productivity losses attributable to headache, and their attempted recovery, in a heavy-manufacturing workforce in Turkey: implications for employers and politicians. *The Journal of Headache and Pain*, *16*(1), 96. https://doi.org/10.1186/s10194-015-0579-4

Shukla, A., & Srivastava, R. (2016). Development of short questionnaire to measure an extended set of role expectation conflict, coworker support and work-life balance: The new job stress scale. *Cogent Business and Management*, *3*(1).

https://doi.org/10.1080/23311975.2015.1134034

Sirgy, M. J., & Lee, D.-J. (2018). Work-life balance: An integrative review. *Applied Research in Quality of Life*, *13*(1), 229–254.

Skov, T., Borg, V., & Ørhede, E. (1996). Psychosocial and physical risk factors for musculoskeletal disorders of the neck, shoulders, and lower back in salespeople. *Occupational and Environmental Medicine*, *53*(5), 351–356. https://doi.org/10.1136/oem.53.5.351

Smith, T. O., Dainty, J. R., Williamson, E., & Martin, K. R. (2019). Association between musculoskeletal pain with social isolation and loneliness: analysis of the English Longitudinal Study of Ageing. *British Journal of Pain*, *13*(2), 82–90. https://doi.org/10.1177/2049463718802868

Soetman, L. (2011). *Thuiswerken, de trend van het moment.* https://essay.utwente.nl/61693/

Song, Y., & Gao, J. (2018). Does Telework Stress Employees Out ? A Study on Working at Home and Subjective Well-Being for Wage / Salary Workers Does Telework Stress Employees Out ? A Study on Working at Home and Subjective Well-Being for Wage / Salary Workers. *IZA Discussion Paper*, *11993*, 2.

Sprung, J. M., & Rogers, A. (2020). Work-life balance as a predictor of college student anxiety and depression. *Journal of American College Health*, *0*(0), 1–8. https://doi.org/10.1080/07448481.2019.1706540

Srivastava, A. K., & Krishna, A. (1992). Employees' Job Involvement and Mental Health in Public and Private Sector Organizations: A Comparative Study. *Indian Journal of Industrial Relations*, *28*(1), 62–70. http://www.jstor.org/stable/27767232

Standen, P., Daniels, K., & Lamond, D. (1999). The home as a workplace: work-family interaction and psychological well-being in telework. *Journal of Occupational Health Psychology*, *4*(4), 368–381. https://doi.org/10.1037/1076-8998.4.4.368

Stanworth, C. (1998). Telework and the Information Age. *New Technology, Work and Employment*, *13*(1). https://doi.org/10.1111/1468-005X.00038

Stassart, C., Hansez, I., Delvaux, M., Depauw, B., & Etienne, A.-M. (2013). A French Translation of the Revised Childhood Anxiety Sensitivity Index (Casi-R): Its Factor Structure, Reliability, and Validity in a Nonclinical Sample of Children Aged 12 and 13 Years Old. *Psychologica Belgica*, *53*(1), 57. https://doi.org/10.5334/pb-53-1-57

Statista Research Department. (2020). *Share of teleworkers in the Netherlands 2019, by age group*. http://library1.nida.ac.th/termpaper6/sd/2554/19755.pdf

Steward, B. (2001). Health trade-offs in teleworking. *The Indexer*, *22*(3), 142–146. https://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.557.1163&rep=rep1&type=pdf

Tavakol, M., & Dennick, R. (2011). Making sense of Cronbach's alpha. *International Journal of Medical Education*, *2*, 53–55. https://doi.org/10.5116/ijme.4dfb.8dfd

Tavares, A. I. (2017). Telework and health effects review. *International Journal of Healthcare*, *3*(2), 30. https://doi.org/10.5430/ijh.v3n2p30

Thorstensson, E. (2020). *The Influence of Working from Home on Employees' Productivity*.

Tijdink, J. K., Vergouwen, A. C., & Smulders, Y. M. (2014). Emotional exhaustion and burnout among medical professors; a nationwide survey. *BMC Medical Education*, *14*(1), 183. https://doi.org/10.1186/1472-6920-14-183

Tisu, L., Lupșa, D., Vîrgă, D., & Rusu, A. (2020). Personality characteristics, job performance and mental health the mediating role of work engagement. *Personality and Individual Differences*, *153*(October 2019), 109644. https://doi.org/10.1016/j.paid.2019.109644

Tkalac Verčič, A. (2021). The impact of employee engagement, organisational support and employer branding on internal communication satisfaction. *Public Relations Review*, *47*(1), 102009. https://doi.org/https://doi.org/10.1016/j.pubrev.2021.102009

Tomczak, E. (2014). The need to report effect size estimates revisited. An overview of some recommended measures of effect size L. *Trends in Sport Sciences*, *1*(21), 19–25. https://www.researchgate.net/publication/303919832

Toscano, F., & Zappalà, S. (2020). Social isolation and stress as predictors of productivity perception and remote work satisfaction during the COVID-19 pandemic: The role of concern about the virus in a moderated double mediation. *Sustainability (Switzerland)*, *12*(23), 1–14. https://doi.org/10.3390/su12239804

Troup, C., & Rose, J. (2012). Working from home: do formal or informal telework arrangements provide better work–family outcomes? *Community, Work & Family*, *15*(4). https://doi.org/10.1080/13668803.2012.724220

Trouw. (2020). *Thuiswerken lijkt een blijvertje, ook na corona*.

Tükel, Y., Kaplan, T., Sipahi, K., Atilgan, D., & Aktaş, S. (2018). Occupational Burnout Levels of Workers employed as Regular and Permanent Workers in the Affiliated Institutions of Konya Provincial Directorate of Family and Social Policies. *International Journal of Modern Education Studies*, *2*. https://doi.org/10.51383/ijonmes.2018.21

U.S. Office of Personnel Management. (2020). *Frequently Asked Questions - Telework*. http://library1.nida.ac.th/termpaper6/sd/2554/19755.pdf

United States Environmental Protection Agency. (1991). Indoor Air Facts No. 4 Sick Building Syndrome. *EPA - Air & Radiation (6609J), Research and Development (MD-56)*, 1–4. https://www.epa.gov/sites/production/files/2014-08/documents/sick_building_factsheet.pdf

van der Doef, M. P., & Schelvis, R. M. C. (2019). Relations Between Psychosocial Job Characteristics and Work Ability in Employees with Chronic Headaches. *Journal of Occupational Rehabilitation*, *29*(1), 119–127. https://doi.org/10.1007/s10926-018-9769-7

Van Der Meulen, N., Van Baalen, P., & Van Heck, E. (2012). Please, do not disturb. telework, distractions, and the productivity of the knowledge worker. *International Conference on Information Systems, ICIS 2012*, *5*, 4509–4519.

Vittersø, J., Akselsen, S., Evjemo, B., Julsrud, T. E., Yttri, B., & Bergvik, S. (2003). Impacts of Home-Based Telework on Quality of Life for Employees and Their Partners. Quantitative and Qualitative Results From a European Survey. *Journal of Happiness Studies*, *4*(2), 201–233. https://doi.org/10.1023/A:1024490621548

Vuori, I. (1995). Exercise and physical health: Musculoskeletal health and functional capabilities. *Research Quarterly for Exercise and Sport*, *66*(4), 276–285. https://doi.org/10.1080/02701367.1995.10607912

Wang, J., Li, B., Yang, Q., Wang, H., Norback, D., & Sundell, J. (2013). Sick building syndrome among parents of preschool children in relation to home environment in Chongqing, China. *Chinese Science Bulletin*, *58*(34), 4267–4276. https://doi.org/10.1007/s11434-013-5814-2

Ward, H. (2017). *The impact that working from home has on the overall motivation and performance levels of employees working within a banking organisation*.

Washington State Office of Financial Management. (2018). *Telework Suitability Tool* (Issue April). https://www.ofm.wa.gov/sites/default/files/public/facilities/MWE/telework_determination.pdf

Weitzer, J., Papantoniou, K., Seidel, S., Klösch, G., Caniglia, G., Laubichler, M., Bertau, M., Birmann, B. M., Jäger, C. C., Zenk, L., Steiner, G., & Schernhammer, E. (2021). Working from home, quality of life, and perceived productivity during the first 50-day COVID-19 mitigation measures in Austria: a cross-sectional study. *International Archives of Occupational and Environmental Health*, *0123456789*. https://doi.org/10.1007/s00420-021-01692-0

Wiesenfeld, B. M., Raghuram, S., & Garud, R. (1999). Communication Patterns as Determinants of Organizational Identification in a Virtual Organization. *Organization Science*, *10*(6), 777–790. http://www.jstor.org/stable/2640241

Wolf, K. (2010). Making the Link between Health and Productivity at the Workplace - A Global Perspective. *Industrial Health*, *48*(3). https://doi.org/10.2486/indhealth.48.251

Wood, J., Oh, J., Park, J., & Kim, W. (2020). *The Relationship Between Work Engagement and Work – Life Balance in Organizations : A Review of the Empirical Research*. https://doi.org/10.1177/1534484320917560

World Health Organisation. (1948). *What is The WHO Definition of Health?* https://www.who.int/about/who-we-are/frequently-asked-questions

World Health Organisation. (2002). *Good practice in occupational health services : a contribution to workplace health*. Copenhagen : WHO Regional Office for Europe. https://apps.who.int/iris/handle/10665/107448

World Health Organisation. (2017). *Factsheet: Protecting workers' health*. https://www.who.int/news-room/fact-sheets/detail/protecting-workers'-health

World Health Organisation. (2018a). *Factsheet: Ageing and health*. WHO. https://www.who.int/news-room/fact-sheets/detail/ageing-and-health#:~:text=Common conditions in older age,conditions at the same time.

World Health Organisation. (2018b). WHO guidelines: Management of physical health conditions in adults with severe mental disorders. In *WHO*. https://www.who.int/mental_health/evidence/guidelines_severe_mental_disorders_web_note_2018/en/%0Ahttp://apps.who.int/iris/bitstream/handle/10665/275718/9789241550383-eng.pdf

World Health Organisation. (2019). *Factsheet: Mental disorders*. WHO. https://www.who.int/news-room/fact-

sheets/detail/mental-disorders

World Health Organisation. (2020). *WHO Guidelines on physical activity and sedentary behaviour*. https://www.who.int/publications/i/item/9789240015128

World Health Organisation. (2021). *Benefits of regular physical activity*. https://www.euro.who.int/en/health-topics/disease-prevention/nutrition/a-healthy-lifestyle/benefits-of-regular-physical-activity

Yakovleva, M., Reilly, R. R., & Werko, R. (2010). Why Do We Trust? Moving Beyond Individual to Dyadic Perceptions. *Journal of Applied Psychology*, *95*(1), 79–91. https://doi.org/10.1037/a0017102

Yılmaz, U., Gokler, M. E., & Unsal, A. (2015). Dry eye disease and depression-anxiety-stress: a hospital-based case control study in Turkey. *Pakistan Journal of Medical Sciences*, *31*(3), 626–631. https://doi.org/10.12669/pjms.313.7091

Zajacova, A., & Lawrence, E. M. (2018). The Relationship Between Education and Health: Reducing Disparities Through a Contextual Approach. *Annual Review of Public Health*, *39*(1), 273–289. https://doi.org/10.1146/annurev-publhealth-031816-044628

Zhang, Z. (2000). Implementation of total quality management: An Empirical Study of Chinese Manufacturing Firms [Rijksuniversiteit Groningen]. In *International Journal of Psychosocial Rehabilitation*. https://doi.org/10.37200/IJPR/V23I6/PR190774

APPENDICES

Appendix I: *Summary article*

Appendix II: *Questionnaires We Werken Thuis-research project – Week 3 & 7 (available upon request only)*

Appendix III: *Data reduction of questionnaire week 3*

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APPENDIX I: SUMMARY ARTICLE

INTRODUCTION

Home-based telework, where work duties are primarily carried out at home, has seen a rise in popularity the last few years, and specifically the last year as a result of the COVID-19 pandemic. To protect yourself and those close to you from, and to minimize the further spreading of, the COVID-19 virus, the Ministry of Public Health, Welfare and Sport obliged the Dutch labour population to work from home. The Dutch Central Bureau of Statistics (CBS) found that, in the second quartile of 2020, over one-fifth of the Dutch population worked (in part) from home (2020c).

Previous research has shown that there are both advantages and disadvantages to telework. First, telework is found to have a positive effect on productivity (Bloom et al., 2015), flexibility (Grant et al., 2013), job satisfaction (Felstead & Henseke, 2017), work-life balance (Manukjan, 2012) and many more. Conversely, it is found that telework also has significant drawbacks, as teleworkers are found to reduced career progression (Mann et al., 2000), social isolation (Mann & Holdsworth, 2003), reduced organisational support (Golden & Gajendran, 2019), increased presenteeism (Tavares, 2017), and the blurring of one's work-life boundary (Mann & Holdsworth, 2003). Furthermore, telework is found to have effects on employee physical, mental, and social health, as recognized health problems associated with telework can be grouped into four categories: musculoskeletal problems, isolation and depression, stress, and overwork (Tavares, 2017).

Whether telework is beneficial for employee health, job satisfaction and other outcomes, such as health and productivity, is strongly dependent on personal and environmental factors (Tavares, 2017). Currently, there is only limited knowledge on the relationship between the personal- and environmental factors of teleworkers and their health and productivity, especially when being obliged to perform full-time telework. Therefore, this research aims to identify how the personal and environmental factors of teleworkers affect their health and perceived productivity during the COVID-19 pandemic.

LITERATURE REVIEW

As suggested by Stanworth (1998), it was found that several personal characteristics, such as gender, age, job role and education influence the health and productivity of teleworkers. First, gender differences were revealed, in which it was found that female teleworkers experience higher levels of physical and mental ill-health compared to male teleworkers (Henke et al., 2016; Mann & Holdsworth, 2003; Nakrošiene et al., 2019; Olson & Primps, 1984; Song & Gao, 2018; Steward, 2001). Previous research suggests this to be related to the dual responsibilities of teleworking women as, even during the COVID-19 lockdown, women are still carrying most of the burden of childcare and household chores (Czymara et al., 2021). These dual responsibilities are revealed to be associated with increased stress, poor work-life balance, and reduced productivity.

Older age is associated with negative effects on physical health (WHO, 2018), while younger age groups are considered to be more at risk of depression (Henke et al., 2016). Not all jobs are found to be suitable for telework, as it involves a certain degree of autonomy, intrinsic motivation, and long periods of quiet concentration, as well as communication needs that can be met through existing technologies (Hobbs & Armstrong, 1998). While management positions appear to be unsuitable for telework (Parker et al., 2020), several studies argue that managers and supervisors should make it a point to regularly participate in telework, to lead by example, be comfortable with the dynamics of managing in a telework environment, and experience the positive and negative aspects themselves (U.S. Office of Personnel Management, 2020).

Higher educational attainment is found to be associated with greater health and higher productivity compared to those who are less educated (Ng & Feldman, 2009; Zajacova & Lawrence, 2018). According to Zajacova & Lawrence (2018), education leads to better-paying jobs which allow families to accumulate wealth that can be used to improve health. The education-productivity relationship is suggested to be associated with important characteristics of successful teleworkers, such as autonomous work and low interdependency for which highly-educated employees are more prepared (Bailey & Kurland, 2002; Hobbs & Armstrong, 1998). Furthermore, the extent to which (tele)workers are physically active and exhibit good sitting behaviour is also found to be influential in improving physical health (National Cancer Institute, 2020; World Health Organisation, 2018b, 2021).

Following the person-environment fit theory by Kurt Lewin (1936), literature discussing the effects of the physical and social environment on telework outcomes was identified. The suitability of the physical workplace (i.e. good ergonomics and work conditions such as noise and temperature) is considered to be crucial in performing telework successfully, affecting the health and productivity of teleworkers (Ammons & Markham, 2004; Nakrošiene et al., 2019; Tavares, 2017; Thorstensson, 2020). Even though the physical at-home workspace is so important, research reveals that a large proportion of teleworkers worked in dual-purpose living rooms or bedrooms, while only over half of the respondents reported working from purpose-built workplaces (Steward, 2001). Working from dedicated at-home offices (which are enclosed) are reported to provide the best home-working experience while having a dedicated work area – even if it is not enclosed – may still provide a better home working experience than working from a kitchen table or sofa" (Leesman, 2020). Also, the social environment of teleworkers is considered to be important in successful telework practices, in which household size is found to negatively affect the work-life balance of teleworkers resulting in reduced satisfaction with telework and reduced productivity (Golden et al., 2006). It is suggested that demands from family members and the presence of young children are found to negatively affect productivity (Mokhtarian et al., 1998; Nakrošiene et al., 2019). A lack of trust and support between the organisation and the employee was found to harm productivity, social health and satisfaction with telework (Nakrošiene et al., 2019; Thorstensson, 2020).

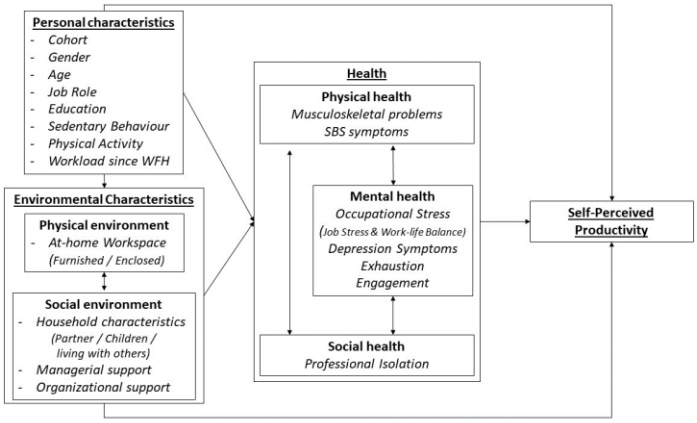
METHODOLOGY

To further analyse the relationships in the conceptual model, quantitative research was carried out using two existing datasets (week 3 and 7), provided by the 'We Work from Home'-research project. The research project, initiated by the Centre for People and Buildings, Aestate/Ontrafelexperts, Eindhoven University of Technology, and the Delft University of Technology, collected data between the 27th of April and the 20th of November of 2020 through weekly questionnaires among Dutch office workers of different public organisations who were obliged to work from home due to the COVID-19 lockdown. The two questionnaires differed slightly on some personal and environmental characteristics, however, it was determined that they were not different enough to not be allowed to compare the two.

The two existing datasets by the 'We Work from Home' measured several aspects of physical, mental, and social health aspects, such as musculoskeletal health, job stress, work-life balance, depression, engagement and professional isolation.

Based on the literature review and 'We Work from Home' questionnaires, relationships between personal and environmental factors and teleworker health and productivity were described. The following conceptual model was designed to visualize the identified relationships (Figure XXI).

Figure XXI Conceptual model



After the data was operationalised, descriptive analyses and bivariate analyses were conducted to analyse the sample and to observe the significance between the relationships in the conceptual model. Last, path analysis (a type of Structural Equation Modelling) is performed to estimate both direct and indirect relationships between independent and dependent variables simultaneously.

DATA DESCRIPTION

After removing invalid responses, a research sample of 25,058 and 18,859 valid responses was used for the descriptive analyses. It was found that the sample from weeks 3 and 7 are fairly similar in gender, job position, and household characteristics. Conversely, statistically significant but very small differences between the samples were found on age and education distributions. The research sample was found to differ from the Dutch labour force, as Dutch public organisations were found to be male-dominated (52%), relatively old, and highly-educated in general. This finding is supported by research by Hulzebosch et al. (2017) which analysed the demographics of employees working from Dutch public organisations. Respondents reported a mean percentage of 81% of the workday to be seated and being physically active for 30+ minutes around 4 days per week (4.24 and 3.79, respectively). 63% of respondents reported having similar workloads since they started working from home, compared to when they were allowed to work in the office. Around 27% of respondents experienced an increase in workload, while roughly 10% experienced a decrease in workload.

Roughly 60% of respondents reported working from dedicated, furnished workspaces most often during their time spent teleworking. Additionally, around 65% of respondents reported working from enclosed at-home workspaces most often, compared to common, non-enclosed workspaces. The majority of the respondents in the dataset were found to live with a partner (76%), while 45% of respondents had children living at home. As 84.5% of respondents state that they live with others, it is consequently found that 15.5% lived alone. On average, the respondents felt relatively supported by the organisation they worked for, and by their manager. On a scale from 1 (very low support) to 5 (very high support), mean organisational support and managerial support scores of 3.25 and 3.24 were found.

Descriptive analysis revealed that many respondents experienced physical and mental health problems, while also feeling relatively professionally isolated. A large difference between week 3 and week 7 data on health was found, as respondents reported significantly fewer health problems in the week 7 questionnaire. It is suggested that this difference may be explained by a concept called ‘anchoring bias’, in which respondents were found to behave significantly different between surveys due to the way the health questions were framed.

On average in week 3 data, respondents reported suffering from 0.98 musculoskeletal problems (such as neck/shoulder pain), 0.35 symptoms of Sick Building Syndrome (such as headaches, or irritation of the eyes/nose/throat).

Occupational stress, consisting of job stress and the work-life balance, was measured through parts of the Job Stress Scale (JSS) by Shukla & Srivastava (2016). A mean stress measure, on a scale from (very low stress) to 5 (very high stress), of 2.47 in week 3 was found. Additionally, a mean work-life balance measure, on a scale from (very poor balance) to 5 (very good balance), of 3.42 in week 3 was identified. On average in week 3 data, respondents reported suffering from 0.57 symptoms of depression (such as having little interest or enjoyment in doing things, feeling gloomy, depressed, or hopeless). Week 3 data also revealed mean exhaustion, on a scale from (very low exhaustion) to 5 (very high exhaustion), of 2.49. Following the UWES by Schaufeli & Bakker (2004) a mean engagement on a scale from 1 (very low engagement) to 5 (very high engagement) of 3.76 was found for week 3 data.

Professional isolation was measured through the Professional Isolation scale by Golden et al. (2008), in which 1 represents very low professional isolation, and 5 represents very high professional isolation. In week 3 a mean professional isolation of 3.15 was found.

Last, employee productivity was measured by the employees themselves and thus is a perceived productivity measurement. perceived productivity is different from one's actual productivity, as perceived productivity is subjective and lacks reference, however, perceived productivity data is much easier to obtain (Leaman & Bordass, 1999). Mean perceived productivity scores, on a 1 (low productivity) to 10 (high productivity), of 7.59 were identified (SD=1.21).

Considering the many similarities in demographic data between week 3 and 7 data, and that the differences between datasets regarding age and education are only small, it was determined that bivariate and path analysis will only be performed on week 3's dataset.

BIVARIATE ANALYSIS

Bivariate analysis of the week 3 dataset identified many significant relationships between personal characteristics and environmental characteristics, health aspects and productivity. The significant relationships in the bivariate analysis were consequently used for the path analysis. Therefore, only the relationships that could not be included in the path model, due to the limitations of Structural Equation Modelling with LISREL regarding the use of endogenous dummy variables (Finney & DiStefano, 2006), are discussed in this section. This limitation is only associated with the relationships between personal characteristics (such as gender and age) and dummy environmental characteristics, which are factors of the at-home workplace (furnished and/or enclosed workspace) and household factors (having a partner, children, living with others).

Regarding the at-home workplace, male respondents were found to work more frequently from furnished and enclosed workspaces, compared to female and non-binary respondents. Furthermore, older age was found to be associated with working from furnished and enclosed workspaces more often than younger respondents. Highly educated respondents worked from furnished and enclosed workspaces more often than respondents with lower education levels. Respondents who reported a decrease in workload since they started to work from home, were found to be significantly less likely to work from furnished and enclosed workspaces compared to respondents with similar or increased workloads.

Respondents who reported a non-binary gender were more likely to live alone, compared to male and female respondents. Older respondents were more likely to live with a partner, compared to younger respondents, while respondents aged 31-40 and 41-50 years old were more likely to have children that

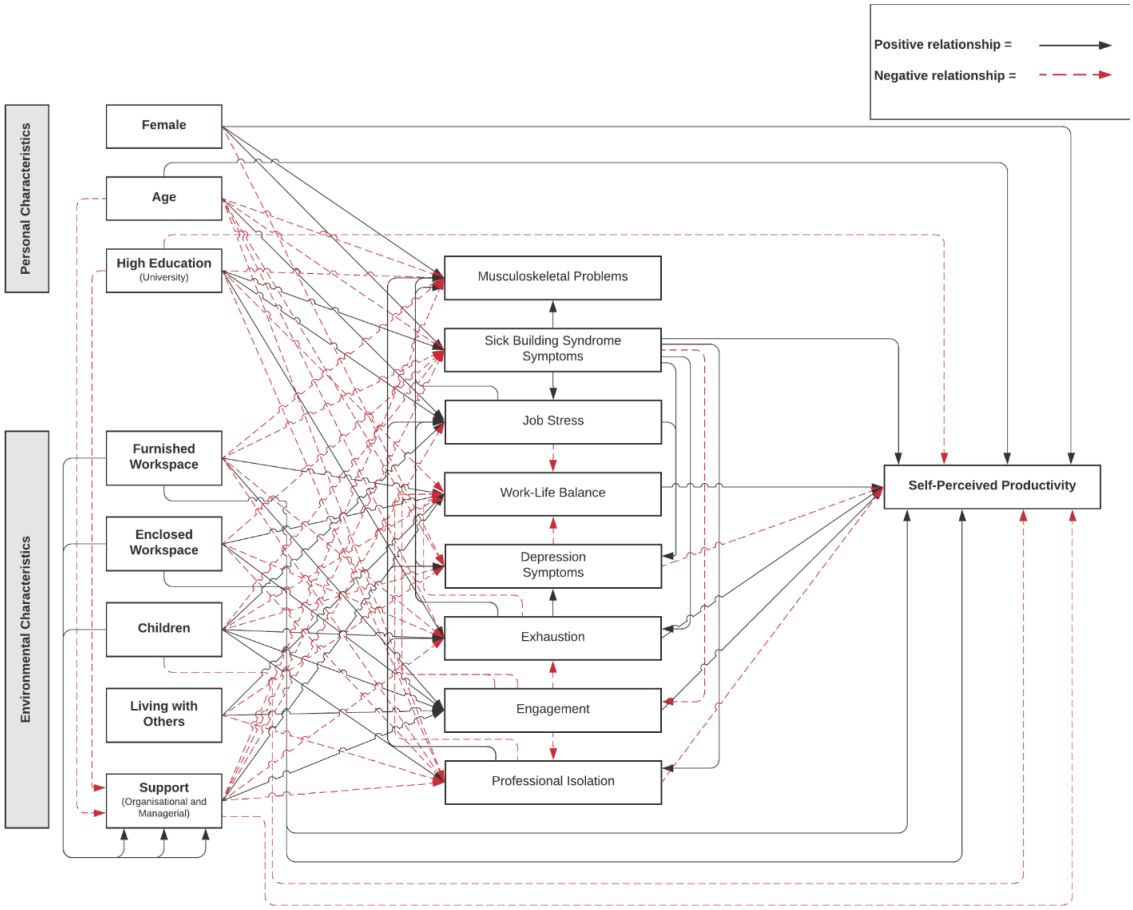
lived at home compared to other age groups. Job role was found to be significantly related to household factors, in which management employees were more likely to have a partner, children and live with others, compared to regular employees. Similarly, highly educated respondents were significantly more likely to have children than persons with primary and secondary education levels. Last, respondents who reported an increase in workload, since they started to work from home, were more likely to have children living at home.

PATH ANALYSIS

The path model was estimated using the statistical package LISREL version 8.54, for which categorical variables in the model were recoded into dummy variables. Before the path analysis, 307 respondents were removed from the data, being respondents with non-binary genders (118), and those who stated having 'other' education (189) as these groups were too small to be suitable for path analysis.

All significant relationships that were identified in the bivariate analysis were used as input for the path analysis. Consequently, the path model was optimized by removing the relationships which were found to be not significant at the 0.05 significance level ($t \leq 1.96$) for the model, until an acceptable model fit was achieved. For the final path model, an acceptable model fit was achieved with a Goodness of Fit index (GFI) and Comparative Fit Index (CFI) of 1.0, a Root Mean Square Error of Approximation (RMSEA) of 0.012, and a Root Mean Square Residual (RMR) of 0.0033 were achieved, which are found to meet the requirements of acceptable fit according to (Byrne, 1998; de Jong, 1999)

Figure XXII Path model with significant relationships only



Most of the significant relationships in the model were found to be in line with previous research regarding health and productivity. Gender, age and education level were found to have predictive power over organisational and managerial support, musculoskeletal health, suffering from SBS symptoms, occupational stress, depression, exhaustion, engagement, professional isolation, and perceived productivity. Whether the at-home workplace was furnished and enclosed or not was found to not only positively affect physical health, but it was also found to impact mental and social health, as well as perceived productivity. Having children, or living with others, was found to affect mental and social health. The degree of support one experiences while teleworking was found to impact mental and social health, in which high support was associated with a positive influence on mental and social health. These personal and environmental characteristics were found to be significantly related to perceived productivity, however, most of these effects were mediated by physical, mental, and social health aspects. In which more than half of the total effects from personal and environmental characteristics on perceived productivity were mediated by the different health aspects in the model, except for the effects of gender and whether someone has children on perceived productivity.

The explanatory analysis found that the majority of teleworkers with physical health problems think these problems are caused by their sedentary behaviour, in which there is too little alteration between sitting and standing or walking (74.7%). Similarly, most of the respondents with mental health problems attribute their problems to being obliged to work from home (66.6%) and feeling socially isolated (57%). Despite the high prevalence of reported health problems, only 6.2% reported calling in sick. Many respondents claim that contact with colleagues has become less personal compared to before they were obliged to work from home. Also, respondents report that they find it more rewarding to see their colleagues in meetings from home, which may be associated with the increase of interactions with colleagues through email or messenger platforms.

CONCLUSION, DISCUSSION & RECOMMENDATIONS

This study aimed to identify the effects of personal characteristics and environmental factors on the health and productivity of teleworkers during the COVID-19 pandemic. Through careful descriptive, bivariate and path analyses, it was found that gender, age, and education level, the at-home workplace and household factors have predictive power over organisational support, musculoskeletal health, suffering from SBS symptoms, occupational stress, depression, exhaustion, engagement, professional isolation, and perceived productivity. However, most of these effects of personal and environmental characteristics were found to be mediated by aspects of physical, mental, and social health.

The current research emphasizes the importance of the physical and social suitability of the at-home workspace in successful telework, as proposed by previous research (e.g. Bloom et al., 2015; Mann & Holdsworth, 2003; Nakrošiene et al., 2019; Steward, 2001; Tavares, 2017; Thorstensson, 2020). The study also provides a holistic view of the relationship between the at-home environment and perceived health and productivity, as in normal telework research some sort of self-selection takes place in which employees with suitable home situations choose to telework.

The study should be considered a snapshot of the COVID-19 pandemic. As the relationships regarding mental and social health possibly contain biases or exaggerations, the generalizability of the results is limited. Moreover, the results of the current research are limited by not having assessed other potentially influential aspects of the physical and social working environment, and employee health (such as indoor temperature, lighting and noise, as well as job satisfaction). Last, the results of this research are also limited by the methodological and practical limitations of Structural Equation Modelling (SEM). Consequently, future research should try to overcome the various limitation of the current study.

APPENDIX II: QUESTIONNAIRES WE WERKEN THUIS-RESEARCH PROJECT – WEEK 3 & 7

The questionnaires are available on request from the Centre for People and Building

APPENDIX III: DATA REDUCTION OF QUESTIONNAIRE WEEK 3

A3.1 ENGAGEMENT SCORE (UWES) - Schaufeli & Bakker (2004a)

Descriptive statistics

Statement	Mean	Std. Deviation	N
I am enthusiastic about my work.	3,97	,776	26910
My work inspires me.	3,77	,828	26910
When I get up in the morning, I feel like going to work.	3,56	,842	26910
When I am working very intensively, I feel happy.	3,83	,750	26910
I am proud of the work I do.	3,96	,756	26910
I am totally immersed by my work	3,48	,870	26910

Inter-item correlation matrix

	I am enthusiastic about my work.	*My work inspires me.*	*When I get up in the morning, I feel like going to work.*	*When I am working very intensively, I feel happy.*	*I am proud of the work I do.*	*I am totally immersed in my work*
I am enthusiastic about my work.	1,000					
My work inspires me.	,795	1,000				
When I get up in the morning, I feel like going to work.	,646	,653	1,000			
When I am working very intensively, I feel happy.	,404	,434	,410	1,000		
I am proud of the work I do.	,634	,641	,499	,427	1,000	
I am totally immersed by my work	,498	,534	,494	,409	,526	1,000

Reliability statistics Engagement-score

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,873	,873	6

Approved for dimension reduction:

- *The means of the variables are not significantly different;*
- *Inter-item correlation is high;*
- *Cronbach's Alpha is in the acceptable values range from 0.70 to 0.95;*
- *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Engagement-score

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Engagement Score	27260	1	5	3,76123	,629502	,396

A3.2 PROFESSIONAL ISOLATION - Golden et al. (2008)

Descriptive statistics

Statement	N	Mean	Std. Deviation
I miss face-to-face contact with coworkers	27153	3,99	1,005
I miss informal interaction with others	27082	4,00	,995
I feel out of the loop	26990	2,90	1,052
I miss out on opportunities to be mentored	26729	2,37	,937

I miss the emotional support of coworkers	26650	2,86	1,053
I feel left out on activities and meetings that could enhance my career.	25947	2,78	1,065
I feel isolated	26906	3,10	1,117

Inter-item correlation matrix

	I miss face-to-face contact with coworkers	*I miss informal interaction with others*	*I feel out of the loop*	*I miss out on opportunities to be mentored*	*I miss the emotional support of coworkers*	*I feel left out on activities and meetings that could enhance my career.*	*I feel isolated*
I miss face-to-face contact with coworkers	1,000						
I miss informal interaction with others	,759	1,000					
I feel out of the loop	,365	,399	1,000				
I miss out on opportunities to be mentored	,287	,276	,468	1,000			
I miss the emotional support of coworkers	,508	,489	,428	,457	1,000		
I feel left out on activities and meetings that could enhance my career.	,322	,326	,370	,419	,428	1,000	
I feel isolated	,562	,534	,506	,413	,562	,403	1,000

Reliability statistics Professional Isolation Score

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,848	,847	7

Approved for dimension reduction:

- *The means of the variables are not significantly different;*
- *Inter-item correlation is high;*
- *Cronbach's Alpha is in the acceptable values range from 0.70 to 0.95;*
- *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Professional Isolation Score

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Professional Isolation Score	27235	1	5	3,1534	,75010	,563

A3.3 JOB STRESS SCORE (MORE WORK) – Shukla & Srivastava (2016) / Jamal & Baba (1992)

Descriptive statistics

Statement	N	Mean	Std. Deviation
I have a lot of work and I'm afraid I don't have enough time to finish it (well)	7006	3,37	,998
I feel so much work pressure that taking a day off makes me feel bad.	7006	3,01	1,108
I feel like I am never free	7006	2,94	1,103
The amount of work makes me nervous	7006	2,78	1,022
My work feels like a great burden	7006	2,40	,930

I feel bad if I take a day off	7006	2,53	1,084

Inter-item correlation matrix

	I have a lot of work and I'm afraid I don't have enough time to finish it (well)	*I feel so much work pressure that taking a day off makes me feel bad.*	*I feel like I am never free*	*The amount of work makes me nervous*	*My work feels like a great burden*	*I feel bad if I take a day off*
I have a lot of work and I'm afraid I don't have enough time to finish it (well)	*1,000*					
I feel so much work pressure that taking a day off makes me feel bad.	*,600*	*1,000*				
I feel like I am never free	*,402*	*,569*	*1,000*			
The amount of work makes me nervous	*,590*	*,582*	*,467*	*1,000*		
My work feels like a great burden	*,481*	*,536*	*,508*	*,702*	*1,000*	
I feel bad if I take a day off	*,417*	*,627*	*,526*	*,512*	*,535*	*1,000*

Reliability statistics Job Stress Score (More Work)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,873	,874	6

Approved for dimension reduction:

- *The means of the variables are not significantly different;*
- *Inter-item correlation is high;*
- *Cronbach's Alpha is in the acceptable values range from 0.70 to 0.95;*
- *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Job Stress Score (More Work)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Job Stress Score (More Work)	7185	1	5	2,8408	,81655	,667

A3.4 JOB STRESS SCORE (SIMILAR WORKLOAD) – Shukla & Srivastava (2016) / Jamal & Baba (1992)

Descriptive statistics

Statement	N	Mean	Std. Deviation
I have a lot of work and I'm afraid I don't have enough time to finish it (well)	16366	2,58	,899
I feel so much work pressure that taking a day off makes me feel bad.	16366	2,31	,921
I feel like I am never free	16366	2,38	,990
The amount of work makes me nervous	16366	2,23	,845
My work feels like a great burden	16366	2,04	,782
I feel bad if I take a day off	16366	2,05	,890

Inter-item correlation matrix

	I have a lot of work and I'm afraid I don't have enough time to finish it (well)	*I feel so much work pressure that taking a day off makes me feel bad.*	*I feel like I am never free*	*The amount of work makes me nervous*	*My work feels like a great burden*	*I feel bad if I take a day off*

I have a lot of work and I'm afraid I don't have enough time to finish it (well)	1,000					
I feel so much work pressure that taking a day off makes me feel bad.	,611	1,000				
I feel like I am never free	,415	,551	1,000			
The amount of work makes me nervous	,619	,639	,521	1,000		
My work feels like a great burden	,461	,542	,525	,689	1,000	
I feel bad if I take a day off	,403	,593	,514	,519	,512	1,000

Reliability statistics Job Stress Score (Similar Workload)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,874	,876	6

Approved for dimension reduction:

- *The means of the variables are not significantly different;*
- *Inter-item correlation is high;*
- *Cronbach's Alpha is in the acceptable values range from 0.70 to 0.95;*
- *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Job Stress Score (Similar Workload)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Job Stress Score (Similar Workload)	16963	1	5	2,2681	,70200	,493

A3.5 JOB STRESS (LESS WORK)

Correlation matrix

	I spread my work as well as possible over the working day	*For my own peace of mind, I have made arrangements about my working hours now that I have less work.*	*I feel inspired to think about innovations in work now that I have less work (R)*	*I look up to the things I still have to do now that I have less work to do*	*I have so little work that I don't feel useful*	*It makes me nervous that I have less work now*	*The fact that I have less work feels like a big burden*	*It makes me angry that I can do less for work*
I spread my work as well as possible over the working day	*1,000*							
For my own peace of mind, I have made arrangements about my working hours now that I have less work.	*,115*	*1,000*						
I feel inspired to think about innovations in work now that I have less work (R)	*,166*	*,177*	*1,000*					
I look up to the things I still have to do now that I have less work to do	*-,124*	*,034*	*-,103*	*1,000*				

I have so little work that I don't feel useful	*-,122*	*,047*	*-,144*	*,355*	*1,000*			
It makes me nervous that I have less work now	*-,058*	*,080*	*-,050*	*,346*	*,563*	*1,000*		
The fact that I have less work feels like a big burden	*-,091*	*,068*	*-,090*	*,375*	*,603*	*,724*	*1,000*	
It makes me angry that I can do less for work	*-,034*	*,102*	*-,036*	*,279*	*,418*	*,498*	*,609*	*1,000*

Descriptive statistics

Statement	N	Mean	Std. Deviation
I look up to the things I still have to do now that I have less work to do	2693	2,87	1,053
I have so little work that I don't feel useful	2693	2,71	1,094
It makes me nervous that I have less work now	2693	2,61	1,059
The fact that I have less work feels like a big burden	2693	2,67	1,051
It makes me angry that I can do less for work	2693	2,48	1,033

Inter-item correlation matrix

	I look up to the things I still have to do now that I have less work to do	*I have so little work that I don't feel useful*	*It makes me nervous that I have less work now*	*The fact that I have less work feels like a big burden*	*It makes me angry that I can do less for work*
I look up to the things I still have to do now that I have less work to do	*1,000*				
I have so little work that I don't feel useful	*,354*	*1,000*			
It makes me nervous that I have less work now	*,346*	*,562*	*1,000*		
The fact that I have less work feels like a big burden	*,372*	*,601*	*,727*	*1,000*	
It makes me angry that I can do less for work	*,280*	*,428*	*,503*	*,612*	*1,000*

Reliability statistics Job Stress Score (Less Work)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,821	,821	5

Approved for dimension reduction:

- *The means of the variables are not significantly different;*
- *Inter-item correlation is high;*
- *Cronbach's Alpha is in the acceptable values range from 0.70 to 0.95;*
- *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Job Stress Score (Less Work)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Job Stress Score (Less work)	2851	1	5	2,6753	,81437	,663

A3.6 WORK-LIFE BALANCE – Shukla & Srivastava (2016) / Brough et al. (2009)

Descriptive statistics

Statement	N	Mean	Std. Deviation
I look up to the things I still have to do now that I have less work to do	27012	3,48	1,024
It makes me angry that I can do less for work	27012	3,37	,994

Inter-item correlation matrix

	I can make a good separation between work and private life in this period of working from home	I feel that work and other activities are currently in balance
I can make a good separation between work and private life in this period of working from home	1,000	
I feel that work and other activities are currently in balance	,682	1,000

Reliability statistics Work-Life Balance

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,811	,811	2

Approved for dimension reduction:

- *The means of the variables are not significantly different;*
- *Inter-item correlation is high;*
- *Cronbach's Alpha is in the acceptable values range from 0.70 to 0.95;*
- *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Work-Life Balance

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Work-Life Balance	27128	1	5	3,4275	,92578	,857

A3.7 EXHAUSTION

Descriptive statistics

Statement	N	Mean	Std. Deviation
(R) I canNOT leave work at the end of the homework day	26794	2,3441	,94856
(R) I canNOT relax well after a day's work at home	26794	2,4400	,91948
I feel mentally tired when I start work in the morning	26794	2,4939	,96722
I feel mentally exhausted by my work at the end of the day	26794	2,6782	1,00526

Inter-item correlation matrix

	(R) I canNOT leave work at the end of the homework day	(R) I canNOT relax well after a day's work at home	I feel mentally tired when I start work in the morning	I feel mentally exhausted by my work at the end of the day
(R) I canNOT leave work at the end of the homework day	*1,000*			
(R) I canNOT relax well after a day's work at home	*,655*	*1,000*		
I DON'T feel mentally tired when I start work in the morning	,355	,515	*1,000*	

I DON'T feel mentally exhausted by my work at the end of the day	,350	,469	,591	*1,000*

Reliability statistics Exhaustion

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,792	,793	4

Approved for dimension reduction:

- *The means of the variables are not significantly different;*
- *Inter-item correlation is high;*
- *Cronbach's Alpha is in the acceptable values range from 0,70 to 0,95;*
- *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Exhaustion

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Exhaustion	27138	1	5	2,4887	,75508	,570

A3.8 ORGANISATIONAL SUPPORT

Descriptive statistics

Statement	N	Mean	Std. Deviation
The organisation pays enough attention to my work-life balance.	26558	3,27	,900
The organisation pays enough attention to health and vitality.	26558	3,23	,934

Inter-item correlation matrix

	The organisation pays enough attention to my work-life balance.	The organisation pays enough attention to health and vitality
The organisation pays enough attention to my work-life balance.	*1,000*	
The organisation pays enough attention to health and vitality	*,619*	*1,000*

Reliability statistics Organisational Support

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,764	,765	2

Approved for dimension reduction:

- *The means of the variables are not significantly different;*
- *Inter-item correlation is high;*
- *Cronbach's Alpha is in the acceptable values range from 0,70 to 0,95;*
- *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Organisational Support

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Organisational Support	26932	1	5	3,2508	,82619	,683

A3.9 MANAGERIAL SUPPORT

Descriptive statistics

Statement	N	Mean	Std. Deviation

My supervisor supports me in balancing my work-life balance	26042	3,34	,952
My supervisor supports me in the areas of health and vitality	26042	3,14	,926

Inter-item correlation matrix

	My supervisor supports me in balancing my work-life balance	My supervisor supports me in the areas of health and vitality
My supervisor supports me in balancing my work-life balance	*1,000*	
My supervisor supports me in the areas of health and vitality	*,769*	*1,000*

Reliability statistics Managerial Support

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,869	,869	2

Approved for dimension reduction:

- *The means of the variables are not significantly different;*
- *Inter-item correlation is high;*
- *Cronbach's Alpha is in the acceptable values range from 0,70 to 0,95;*
- *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Managerial Support

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Managerial Support	26585	1	5	3,2437	,88329	,780

A3.10 PERCEIVED ORGANISATIONAL SUPPORT

Descriptive statistics

Variable	N	Mean	Std. Deviation
Organisational Support	26932	3,2508	,82619
Managerial Support	26585	3,2437	,88329

Inter-item correlation matrix

	Organisational Support	Managerial Support
Organisational Support	*1,000*	
Managerial Support	*,647*	*1,000*

Reliability statistics Perceived Organisational Support

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,784	,786	2

Approved for dimension reduction:

- ✓ *The means of the variables are not significantly different;*
- ✓ *Inter-item correlation is high;*
- ✓ *Cronbach's Alpha is in the acceptable values range from 0,70 to 0,95;*
- ✓ *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Perceived Organisational Support

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Perceived Organisational Support	25058	1	5	3,2469	,77291	,597

APPENDIX IV: DATA REDUCTION OF QUESTIONNAIRE WEEK 7

A4.1 ENGAGEMENT SCORE (UWES) - Schaufeli & Bakker (2004a)

Descriptive statistics

Statement	Mean	Std. Deviation	N
I am enthusiastic about my work.	3,87	,785	20225
My work inspires me.	3,70	,824	20225
When I get up in the morning, I feel like going to work.	3,53	,840	20225
When I am working very intensively, I feel happy.	3,78	,750	20225
I am proud of the work I do.	3,90	,744	20225
I am totally immersed by my work	3,44	,858	20225

Inter-item correlation matrix

	I am enthusiastic about my work.	*My work inspires me.*	*When I get up in the morning, I feel like going to work.*	*When I am working very intensively, I feel happy.*	*I am proud of the work I do.*	*I am totally immersed by my work*
I am enthusiastic about my work.	*1,000*					
My work inspires me.	*,810*	*1,000*				
When I get up in the morning, I feel like going to work.	*,679*	*,683*	*1,000*			
When I am working very intensively, I feel happy.	*,405*	*,441*	*,416*	*1,000*		
I am proud of the work I do.	*,640*	*,641*	*,512*	*,439*	*1,000*	
I am totally immersed by my work	*,504*	*,535*	*,489*	*,418*	*,523*	*1,000*

Reliability statistics Engagement-score

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,877	,877	6

Approved for dimension reduction:

- ✓ *The means of the variables are not significantly different;*
- ✓ *Inter-item correlation is high;*
- ✓ *Cronbach's Alpha is in the acceptable values range from 0.70 to 0.95;*
- ✓ *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Engagement-score

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Engagement Score	20490	1	5	3,7040	,63057	,398

A4.2 JOB STRESS SCORE (MORE WORK) – Shukla & Srivastava (2016) / Jamal & Baba (1992)

Descriptive statistics

Statement	N	Mean	Std. Deviation
I have a lot of work and I'm afraid I don't have enough time to finish it (well)	5279	3,2510	,98265
I feel so much work pressure that taking a day off makes me feel bad.	5279	2,9769	1,09610
I feel like I am never free	5279	2,9132	1,10343
The amount of work makes me nervous	5279	2,7363	,99724
My work feels like a great burden	5279	2,3790	,89592
I feel bad if I take a day off	5279	2,5755	1,09511

Inter-item correlation matrix

	I have a lot of work and I'm afraid I don't have enough time to finish it (well)	*I feel so much work pressure that taking a day off makes me feel bad.*	*I feel like I am never free*	*The amount of work makes me nervous*	*My work feels like a great burden*	*I feel bad if I take a day off*
I have a lot of work and I'm afraid I don't have enough time to finish it (well)	1,000					
I feel so much work pressure that taking a day off makes me feel bad.	,558	1,000				
I feel like I am never free	,381	,593	1,000			
The amount of work makes me nervous	,537	,591	,477	1,000		
My work feels like a great burden	,448	,540	,512	,705	1,000	
I feel bad if I take a day off	,397	,656	,570	,521	,539	1,000

Reliability statistics Job Stress Score (More Work)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,872	,873	6

Approved for dimension reduction:

- ✓ *The means of the variables are not significantly different;*
- ✓ *Inter-item correlation is high;*
- ✓ *Cronbach's Alpha is in the acceptable values range from 0.70 to 0.95;*
- ✓ *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Job Stress Score (More Work)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Job Stress Score (More Work)	5423	1	5	2,8082	,80520	,648

A4.3 JOB STRESS SCORE (SIMILAR WORKLOAD) – Shukla & Srivastava (2016) / Jamal & Baba (1992)

Descriptive statistics

Statement	N	Mean	Std. Deviation
I have a lot of work and I'm afraid I don't have enough time to finish it (well)	2,4895	,85964	12625
I feel so much work pressure that taking a day off makes me feel bad.	2,2895	,89874	12625
I feel like I am never free	2,3653	,97778	12625
The amount of work makes me nervous	2,1960	,81188	12625
My work feels like a great burden	2,0356	,75934	12625
I feel bad if I take a day off	2,0617	,87977	12625

Inter-item correlation matrix

	I have a lot of work and I'm afraid I don't have enough time to finish it (well)	*I feel so much work pressure that taking a day off makes me feel bad.*	*I feel like I am never free*	*The amount of work makes me nervous*	*My work feels like a great burden*	*I feel bad if I take a day off*
I have a lot of work and I'm afraid I don't have enough time to finish it (well)	*1,000*					
I feel so much work pressure that taking a day off makes me feel bad.	*,594*	*1,000*				
I feel like I am never free	*,386*	*,537*	*1,000*			
The amount of work makes me nervous	*,598*	*,629*	*,517*	*1,000*		
My work feels like a great burden	*,452*	*,539*	*,527*	*,685*	*1,000*	
I feel bad if I take a day off	*,388*	*,599*	*,530*	*,518*	*,508*	*1,000*

Reliability statistics Job Stress Score (Similar Workload)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,870	,873	6

Approved for dimension reduction:

- ✓ *The means of the variables are not significantly different;*
- ✓ *Inter-item correlation is high;*
- ✓ *Cronbach's Alpha is in the acceptable values range from 0.70 to 0.95;*
- ✓ *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Job Stress Score (Similar Workload)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Job Stress Score (Similar Workload)	13105	1	5	2,2453	,68227	,465

A4.4 JOB STRESS (LESS WORK)

Correlation matrix

	I spread my work as well as possible over the working day	For my own peace of mind, I have made arrangements about my working hours now that I have less work.	I feel inspired to think about innovations in work now that I have less work (R)	I look up to the things I still have to do now that I have less work to do	I have so little work that I don't feel useful	It makes me nervous that I have less work now	The fact that I have less work feels like a big burden	It makes me angry that I can do less for work
I spread my work as well as possible over the working day	1,000							
For my own peace of mind, I have made arrangements about my working hours now that I have less work.	,157	1,000						
I feel inspired to think about innovations in work now that I have less work (R)	,213	,239	1,000					
I look up to the things I still have to do now that I have less work to do	-,082	-,050	-,123	1,000				
I have so little work that I don't feel useful	-,072	-,013	-,128	,339	1,000			
It makes me nervous that I have less work now	-,050	-,006	-,015	,335	,579	1,000		
The fact that I have less work feels like a big burden	-,027	-,003	-,048	,382	,609	,750	1,000	
It makes me angry that I can do less for work	-,067	,032	-,060	,289	,446	,524	,594	1,000

Descriptive statistics

Statement	N	Mean	Std. Deviation
I look up to the things I still have to do now that I have less work to do	1724	2,87	1,019
I have so little work that I don't feel useful	1724	2,74	1,083
It makes me nervous that I have less work now	1724	2,66	1,039
The fact that I have less work feels like a big burden	1724	2,71	1,030
It makes me angry that I can do less for work	1724	2,57	1,037

Inter-item correlation matrix

	I look up to the things I still have to do now that I have less work to do	I have so little work that I don't feel useful	It makes me nervous that I have less work now	The fact that I have less work feels like a big burden	It makes me angry that I can do less for work
I look up to the things I still have to do now that I have less work to do	1,000				
I have so little work that I don't feel useful	,353	1,000			
It makes me nervous that I have less work now	,330	,569	1,000		
The fact that I have less work feels like a big burden	,385	,607	,744	1,000	
It makes me angry that I can do less for work	,290	,449	,521	,598	1,000

Reliability statistics Job Stress Score (Less Work)

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,825	,825	5

Approved for dimension reduction:

- ✓ *The means of the variables are not significantly different;*
- ✓ *Inter-item correlation is high;*
- ✓ *Cronbach's Alpha is in the acceptable values range from 0.70 to 0.95;*
- ✓ *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Job Stress Score (Less Work)

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Job Stress Score (Less work)	1823	1	5	2,7254	,80801	,653

A4.5 WORK-LIFE BALANCE – Shukla & Srivastava (2016) / Brough et al. (2009)

Descriptive statistics

Statement	N	Mean	Std. Deviation
I look up to the things I still have to do now that I have less work to do	20397	3,51	,998
It makes me angry that I can do less for work	20397	3,40	,979

Inter-item correlation matrix

	I can make a good separation between work and private life in this period of working from home	I feel that work and other activities are currently in balance
I can make a good separation between work and private life in this period of working from home	*1,000*	
I feel that work and other activities are currently in balance	*,691*	*1,000*

Reliability statistics Work-Life Balance

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,817	,817	2

Approved for dimension reduction:

- ✓ *The means of the variables are not significantly different;*
- ✓ *Inter-item correlation is high;*
- ✓ *Cronbach's Alpha is in the acceptable values range from 0.70 to 0.95;*
- ✓ *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Work-Life Balance

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Work-Life Balance	20483	1	5	3,4567	,91008	,828

A4.7 EXHAUSTION

Descriptive statistics

Statement	N	Mean	Std. Deviation
(R) I canNOT leave work at the end of the homework day	20248	2,3561	,93163
(R) I canNOT relax well after a day's work at home	20248	2,4378	,90987
I feel mentally tired when I start work in the morning	20248	2,4621	,93760
I feel mentally exhausted by my work at the end of the day	20248	2,6468	,99098

Inter-item correlation matrix

	(R) I can leave work at the end of the homework day	(R) I can relax well after a day's work at home	I feel mentally tired when I start work in the morning	I feel mentally exhausted by my work at the end of the day
(R) I canNOT leave work at the end of the homework day	*1,000*			
(R) I canNOT relax well after a day's work at home	*,690*	*1,000*		
I DON'T feel mentally tired when I start work in the morning	*,400*	*,533*	*1,000*	
I DON'T feel mentally exhausted by my work at the end of the day	*,382*	*,483*	,618	*1,000*

Reliability statistics Exhaustion

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,810	,811	4

Approved for dimension reduction:

- ✓ *The means of the variables are not significantly different;*
- ✓ *Inter-item correlation is high;*
- ✓ *Cronbach's Alpha is in the acceptable values range from 0,70 to 0,95;*
- ✓ *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Exhaustion

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Exhaustion	20476	1	5	2,4745	,75307	,567

A4.8 ORGANISATIONAL SUPPORT

Descriptive statistics

Statement	N	Mean	Std. Deviation
The organisation pays enough attention to my work-life balance	16903	3,25	,914
The organisation takes my personal situation at home into account	16903	3,26	,879
The organisation pays enough attention to health and vitality	16903	3,23	,930

Inter-item correlation matrix

	The organisation pays enough attention to my work-life balance.	The organisation takes my personal situation at home into account	The organisation pays enough attention to health and vitality
The organisation pays enough attention to my work-life balance.	*1,000*		
The organisation takes my personal situation at home into account	*,558*	*1,000*	
The organisation pays enough attention to health and vitality	*,636*	*,554*	*1,000*

Reliability statistics Organisational Support

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,808	,807	3

Approved for dimension reduction:

- ✓ *The means of the variables are not significantly different;*
- ✓ *Inter-item correlation is high;*
- ✓ *Cronbach's Alpha is in the acceptable values range from 0,70 to 0,95;*
- ✓ *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Organisational Support

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Organisational Support	20337	1	5	3,2618	,76866	,591

A4.9 MANAGERIAL SUPPORT

Descriptive statistics

Statement	N	Mean	Std. Deviation
My supervisor supports me in balancing my work-life balance	18724	3,31	,949
My supervisor supports me in the areas of health and vitality	18724	3,16	,936

Inter-item correlation matrix

	My supervisor supports me in balancing my work-life balance	My supervisor supports me in the areas of health and vitality
My supervisor supports me in balancing my work-life balance	*1,000*	
My supervisor supports me in the areas of health and vitality	*,741*	*1,000*

Reliability statistics Managerial Support

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,851	,851	2

Approved for dimension reduction:

- ✓ *The means of the variables are not significantly different;*
- ✓ *Inter-item correlation is high;*
- ✓ *Cronbach's Alpha is in the acceptable values range from 0,70 to 0,95;*
- ✓ *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Managerial Support

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Managerial Support	20039	1	5	3,2400	,87488	,765

A4.10 PERCEIVED ORGANISATIONAL SUPPORT

Descriptive statistics

Variable	N	Mean	Std. Deviation
Organisational Support	18859	2,2417	,87285
Managerial Support	18859	3,2616	,76642

Inter-item correlation matrix

	Organisational Support	Managerial Support
Organisational Support	*1,000*	
Managerial Support	*,688*	*1,000*

Reliability statistics Perceived Organisational Support

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	N of Items
,811	,815	2

Approved for dimension reduction:

- ✓ *The means of the variables are not significantly different;*
- ✓ *Inter-item correlation is high;*
- ✓ *Cronbach's Alpha is in the acceptable values range from 0,70 to 0,95;*
- ✓ *Cronbach's Alpha does not exceed 0,90.*

Descriptive statistics Perceived Organisational Support

	N	Minimum	Maximum	Mean	Std. Deviation	Variance
Perceived Organisational Support	18859	1	5	3,2517	,75331	,567

APPENDIX V: BIVARIATE ANALYSIS' POST HOC TESTS

V.1 PERSONAL CHARACTERISTICS ON PERCEIVED ORGANISATIONAL SUPPORT

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Perceived Organisational Support	Male	Female	-,04651*	0.00979	0.000	-0.0695	-0.0236
		Other	,31298*	0.07145	0.000	0.1455	0.4804
	Female	Male	,04651*	0.00979	0.000	0.0236	0.0695
		Other	,35949*	0.07141	0.000	0.1921	0.5269
	Other	Male	-,31298*	0.07145	0.000	-0.4804	-0.1455
		Female	-,35949*	0.07141	0.000	-0.5269	-0.1921

*. The mean difference is significant at the 0.05 level.

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Perceived Organisational Support	<= 30 years old	31-40 years old	-0.02626	0.02353	0.798	-0.0905	0.0379
		41-50 years old	-0.00562	0.02225	0.999	-0.0663	0.0551
		51-60 years old	0.04697	0.02106	0.168	-0.0105	0.1044
		> 60 years old	0.05551	0.02378	0.134	-0.0094	0.1204
	31-40 years old	<= 30 years old	0.02626	0.02353	0.798	-0.0379	0.0905
		41-50 years old	0.02064	0.01809	0.785	-0.0287	0.0700
		51-60 years old	,07323*	0.01660	0.000	0.0279	0.1185
		> 60 years old	,08178*	0.01994	0.000	0.0274	0.1362
	41-50 years old	<= 30 years old	0.00562	0.02225	0.999	-0.0551	0.0663
		31-40 years old	-0.02064	0.01809	0.785	-0.0700	0.0287
		51-60 years old	,05259*	0.01473	0.003	0.0124	0.0928
		> 60 years old	,06113*	0.01841	0.008	0.0109	0.1114
	51-60 years old	<= 30 years old	-0.04697	0.02106	0.168	-0.1044	0.0105
		31-40 years old	-,07323*	0.01660	0.000	-0.1185	-0.0279
		41-50 years old	-,05259*	0.01473	0.003	-0.0928	-0.0124
		> 60 years old	0.00854	0.01695	0.987	-0.0377	0.0548
	> 60 years old	<= 30 years old	-0.05551	0.02378	0.134	-0.1204	0.0094
		31-40 years old	-,08178*	0.01994	0.000	-0.1362	-0.0274
		41-50 years old	-,06113*	0.01841	0.008	-0.1114	-0.0109

		51-60 years old	-0.00854	0.01695	0.987	-0.0548	0.0377

*. The mean difference is significant at the 0.05 level.

Education level **Tukey HSD Post Hoc Test**

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Perceived Organisational Support	Primary & Secondary Education	MBO	-0.04238	0.02549	0.457	-0.1119	0.0272
		HBO	0.04043	0.02343	0.418	-0.0235	0.1043
		University	,11388*	0.02368	0.000	0.0493	0.1785
		Other	0.16706	0.06610	0.085	-0.0133	0.3474
	MBO	Primary & Secondary Education	0.04238	0.02549	0.457	-0.0272	0.1119
		HBO	,08282*	0.01593	0.000	0.0394	0.1263
		University	,15626*	0.01629	0.000	0.1118	0.2007
		Other	,20945*	0.06383	0.009	0.0353	0.3836
	HBO	Primary & Secondary Education	-0.04043	0.02343	0.418	-0.1043	0.0235
		MBO	-,08282*	0.01593	0.000	-0.1263	-0.0394
		University	,07344*	0.01282	0.000	0.0385	0.1084
		Other	0.12663	0.06304	0.262	-0.0453	0.2986
	University	Primary & Secondary Education	-,11388*	0.02368	0.000	-0.1785	-0.0493
		MBO	-,15626*	0.01629	0.000	-0.2007	-0.1118
		HBO	-,07344*	0.01282	0.000	-0.1084	-0.0385
		Other	0.05319	0.06313	0.917	-0.1190	0.2254
	Other	Primary & Secondary Education	-0.16706	0.06610	0.085	-0.3474	0.0133
		MBO	-,20945*	0.06383	0.009	-0.3836	-0.0353
		HBO	-0.12663	0.06304	0.262	-0.2986	0.0453
		University	-0.05319	0.06313	0.917	-0.2254	0.1190

*. The mean difference is significant at the 0.05 level.

V.2 GENDER ON INTERVAL-SCALE HEALTH ASPECTS

Gender — **Tukey HSD Post Hoc Test**

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Total Job Stress	Male	Female	-,05158*	0.00997	0.000	-0.0750	-0.0282
		Other	-,27571*	0.07274	0.000	-0.4462	-0.1052
	Female	Male	,05158*	0.00997	0.000	0.0282	0.0750
		Other	-,22413*	0.07271	0.006	-0.3945	-0.0537
	Other	Male	,27571*	0.07274	0.000	0.1052	0.4462
		Female	,22413*	0.07271	0.006	0.0537	0.3945
Work-Life Balance (Brough et al, 2009)	Male	Female	,085*	0.012	0.000	0.06	0.11
		Other	,244*	0.086	0.012	0.04	0.44
	Female	Male	-,085*	0.012	0.000	-0.11	-0.06
		Other	0.158	0.086	0.153	-0.04	0.36
	Other	Male	-,244*	0.086	0.012	-0.44	-0.04
		Female	-0.158	0.086	0.153	-0.36	0.04
Exhaustion	Male	Female	-,08387*	0.00953	0.000	-0.1062	-0.0615
		Other	-,32129*	0.06952	0.000	-0.4842	-0.1583
	Female	Male	,08387*	0.00953	0.000	0.0615	0.1062
		Other	-,23742*	0.06949	0.002	-0.4003	-0.0746
	Other	Male	,32129*	0.06952	0.000	0.1583	0.4842
		Female	,23742*	0.06949	0.002	0.0746	0.4003
Engagement Score (Schaufeli & Bakker, 2003)	Male	Female	-,02496*	0.00795	0.005	-0.0436	-0.0063
		Other	,14916*	0.05801	0.027	0.0132	0.2851
	Female	Male	,02496*	0.00795	0.005	0.0063	0.0436
		Other	,17412*	0.05798	0.008	0.0382	0.3100
	Other	Male	-,14916*	0.05801	0.027	-0.2851	-0.0132
		Female	-,17412*	0.05798	0.008	-0.3100	-0.0382
Professional Isolation (Golden et al. 2008)	Male	Female	-,07865*	0.00944	0.000	-0.1008	-0.0565
		Other	-0.11630	0.06889	0.210	-0.2778	0.0452
	Female	Male	,07865*	0.00944	0.000	0.0565	0.1008
		Other	-0.03765	0.06886	0.848	-0.1990	0.1237
	Other	Male	0.11630	0.06889	0.210	-0.0452	0.2778
		Female	0.03765	0.06886	0.848	-0.1237	0.1990
Individual Productivity	Male	Female	-,179*	0.015	0.000	-0.22	-0.14
		Other	0.057	0.112	0.867	-0.21	0.32
	Female	Male	,179*	0.015	0.000	0.14	0.22
		Other	0.236	0.112	0.088	-0.03	0.50
	Other	Male	-0.057	0.112	0.867	-0.32	0.21
		Female	-0.236	0.112	0.088	-0.50	0.03

*. The mean difference is significant at the 0.05 level.

V.3 GENDER AND PRODUCTIVITY

Gender — **Tukey HSD Post Hoc Test**

(I) Gender		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Male	Female	-,179*	0.015	0.000	-0.22	-0.14
	Other	0.057	0.112	0.867	-0.21	0.32
Female	Male	,179*	0.015	0.000	0.14	0.22
	Other	0.236	0.112	0.088	-0.03	0.50
Other	Male	-0.057	0.112	0.867	-0.32	0.21
	Female	-0.236	0.112	0.088	-0.50	0.03

*. The mean difference is significant at the 0.05 level.

V.4 AT-HOME WORKSPACE AND HOUSEHOLD TYPE ON PERCEIVED ORGANISATIONAL SUPPORT

Household Type — **Tukey HSD Post Hoc Test**

(I) Household Type		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Single-person household	Single-parent household w/ children	-0.06014	0.02347	0.107	-0.1270	0.0068
	Couple w/o children	-0.02040	0.01477	0.739	-0.0625	0.0217
	Couple w/ children	-,07097*	0.01464	0.000	-0.1127	-0.0292
	Living w/ roommates	-0.04390	0.04398	0.919	-0.1692	0.0814
	Living at home w/ parents	-,17005*	0.04579	0.003	-0.3005	-0.0396
Single-parent household w/ children	Single-person household	0.06014	0.02347	0.107	-0.0068	0.1270
	Couple w/o children	0.03974	0.02150	0.434	-0.0215	0.1010
	Couple w/ children	-0.01083	0.02141	0.996	-0.0718	0.0502
	Living w/ roommates	0.01624	0.04667	0.999	-0.1168	0.1492
	Living at home w/ parents	-0.10992	0.04838	0.206	-0.2478	0.0280
Couple w/o children	Single-person household	0.02040	0.01477	0.739	-0.0217	0.0625
	Single-parent household w/ children	-0.03974	0.02150	0.434	-0.1010	0.0215
	Couple w/ children	-,05057*	0.01120	0.000	-0.0825	-0.0186
	Living w/ roommates	-0.02350	0.04296	0.994	-0.1459	0.0989

	Living at home w/ parents	-,14965*	0.04481	0.011	-0.2774	-0.0220
Couple w/ children	Single-person household	,07097*	0.01464	0.000	0.0292	0.1127
	Single-parent household w/ children	0.01083	0.02141	0.996	-0.0502	0.0718
	Couple w/o children	,05057*	0.01120	0.000	0.0186	0.0825
	Living w/ roommates	0.02707	0.04291	0.989	-0.0952	0.1494
	Living at home w/ parents	-0.09908	0.04476	0.231	-0.2267	0.0285
Living w/ roommates	Single-person household	0.04390	0.04398	0.919	-0.0814	0.1692
	Single-parent household w/ children	-0.01624	0.04667	0.999	-0.1492	0.1168
	Couple w/o children	0.02350	0.04296	0.994	-0.0989	0.1459
	Couple w/ children	-0.02707	0.04291	0.989	-0.1494	0.0952
	Living at home w/ parents	-0.12615	0.06102	0.305	-0.3001	0.0478
Living at home w/ parents	Single-person household	,17005*	0.04579	0.003	0.0396	0.3005
	Single-parent household w/ children	0.10992	0.04838	0.206	-0.0280	0.2478
	Couple w/o children	,14965*	0.04481	0.011	0.0220	0.2774
	Couple w/ children	0.09908	0.04476	0.231	-0.0285	0.2267
	Living w/ roommates	0.12615	0.06102	0.305	-0.0478	0.3001

*. The mean difference is significant at the 0.05 level.

V.5 AT-HOME WORKSPACE AND HOUSEHOLD TYPE ON INTERVAL-SCALE HEALTH ASPECTS

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Total Job Stress	Furnished enclosed workspace	Furnished workspace in a shared room	-,08352*	0.01547	0.000	-0.1233	-0.0438
		Enclosed non-furnished workspace	-,08601*	0.01348	0.000	-0.1206	-0.0514
		Non-enclosed non-furnished workspace	-,09167*	0.01302	0.000	-0.1251	-0.0582
	Furnished workspace in a shared room	Furnished enclosed workspace	,08352*	0.01547	0.000	0.0438	0.1233
		Enclosed non-furnished workspace	-0.00249	0.01775	0.999	-0.0481	0.0431
		Non-enclosed non-furnished workspace	-0.00815	0.01741	0.966	-0.0529	0.0366
	Enclosed non-furnished workspace	Furnished enclosed workspace	,08601*	0.01348	0.000	0.0514	0.1206
		Furnished workspace in a shared room	0.00249	0.01775	0.999	-0.0431	0.0481
		Non-enclosed non-furnished workspace	-0.00566	0.01566	0.984	-0.0459	0.0346
	Non-enclosed non-furnished workspace	Furnished enclosed workspace	,09167*	0.01302	0.000	0.0582	0.1251
		Furnished workspace in a shared room	0.00815	0.01741	0.966	-0.0366	0.0529
		Enclosed non-furnished workspace	0.00566	0.01566	0.984	-0.0346	0.0459
Work-Life Balance (Brough et al, 2009)	Furnished enclosed workspace	Furnished workspace in a shared room	,184*	0.018	0.000	0.14	0.23

		Enclosed non-furnished workspace	,208*	0.016	0.000	0.17	0.25
		Non-enclosed non-furnished workspace	,288*	0.015	0.000	0.25	0.33
	Furnished workspace in a shared room	Furnished enclosed workspace	-,184*	0.018	0.000	-0.23	-0.14
		Enclosed non-furnished workspace	0.024	0.021	0.661	-0.03	0.08
		Non-enclosed non-furnished workspace	,104*	0.020	0.000	0.05	0.16
	Enclosed non-furnished workspace	Furnished enclosed workspace	-,208*	0.016	0.000	-0.25	-0.17
		Furnished workspace in a shared room	-0.024	0.021	0.661	-0.08	0.03
		Non-enclosed non-furnished workspace	,080*	0.018	0.000	0.03	0.13
	Non-enclosed non-furnished workspace	Furnished enclosed workspace	-,288*	0.015	0.000	-0.33	-0.25
		Furnished workspace in a shared room	-,104*	0.020	0.000	-0.16	-0.05
		Enclosed non-furnished workspace	-,080*	0.018	0.000	-0.13	-0.03
Exhaustion	Furnished enclosed workspace	Furnished workspace in a shared room	-,09699*	0.01477	0.000	-0.1349	-0.0590
		Enclosed non-furnished workspace	-,12983*	0.01287	0.000	-0.1629	-0.0968
		Non-enclosed non-furnished workspace	-,13602*	0.01243	0.000	-0.1680	-0.1041
	Furnished workspace in a shared room	Furnished enclosed workspace	,09699*	0.01477	0.000	0.0590	0.1349

		Enclosed non-furnished workspace	-0.03284	0.01695	0.212	-0.0764	0.0107
		Non-enclosed non-furnished workspace	-0.03903	0.01662	0.087	-0.0817	0.0037
	Enclosed non-furnished workspace	Furnished enclosed workspace	,12983*	0.01287	0.000	0.0968	0.1629
		Furnished workspace in a shared room	0.03284	0.01695	0.212	-0.0107	0.0764
		Non-enclosed non-furnished workspace	-0.00619	0.01496	0.976	-0.0446	0.0322
	Non-enclosed non-furnished workspace	Furnished enclosed workspace	,13602*	0.01243	0.000	0.1041	0.1680
		Furnished workspace in a shared room	0.03903	0.01662	0.087	-0.0037	0.0817
		Enclosed non-furnished workspace	0.00619	0.01496	0.976	-0.0322	0.0446
Engagement Score (Schaufeli & Bakker, 2003)	Furnished enclosed workspace	Furnished workspace in a shared room	0.02088	0.01231	0.325	-0.0107	0.0525
		Enclosed non-furnished workspace	,09799*	0.01072	0.000	0.0704	0.1255
		Non-enclosed non-furnished workspace	,11850*	0.01036	0.000	0.0919	0.1451
	Furnished workspace in a shared room	Furnished enclosed workspace	-0.02088	0.01231	0.325	-0.0525	0.0107
		Enclosed non-furnished workspace	,07711*	0.01412	0.000	0.0408	0.1134
		Non-enclosed non-furnished workspace	,09762*	0.01385	0.000	0.0620	0.1332
	Enclosed non-furnished workspace	Furnished enclosed workspace	-,09799*	0.01072	0.000	-0.1255	-0.0704

		Furnished workspace in a shared room	-,07711*	0.01412	0.000	-0.1134	-0.0408
		Non-enclosed non-furnished workspace	0.02051	0.01246	0.353	-0.0115	0.0525
	Non-enclosed non-furnished workspace	Furnished enclosed workspace	-,11850*	0.01036	0.000	-0.1451	-0.0919
		Furnished workspace in a shared room	-,09762*	0.01385	0.000	-0.1332	-0.0620
		Enclosed non-furnished workspace	-0.02051	0.01246	0.353	-0.0525	0.0115
Professional Isolation (Golden et al. 2008)	Furnished enclosed workspace	Furnished workspace in a shared room	-,09155*	0.01464	0.000	-0.1292	-0.0539
		Enclosed non-furnished workspace	-,11986*	0.01275	0.000	-0.1526	-0.0871
		Non-enclosed non-furnished workspace	-,12615*	0.01232	0.000	-0.1578	-0.0945
	Furnished workspace in a shared room	Furnished enclosed workspace	,09155*	0.01464	0.000	0.0539	0.1292
		Enclosed non-furnished workspace	-0.02830	0.01680	0.331	-0.0715	0.0148
		Non-enclosed non-furnished workspace	-0.03459	0.01647	0.153	-0.0769	0.0077
	Enclosed non-furnished workspace	Furnished enclosed workspace	,11986*	0.01275	0.000	0.0871	0.1526
		Furnished workspace in a shared room	0.02830	0.01680	0.331	-0.0148	0.0715
		Non-enclosed non-furnished workspace	-0.00629	0.01482	0.974	-0.0444	0.0318

	Non-enclosed non-furnished workspace	Furnished enclosed workspace	,12615*	0.01232	0.000	0.0945	0.1578
		Furnished workspace in a shared room	0.03459	0.01647	0.153	-0.0077	0.0769
		Enclosed non-furnished workspace	0.00629	0.01482	0.974	-0.0318	0.0444

*. The mean difference is significant at the 0.05 level.

Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Total Job Stress	Single-person household	Single-parent household w/ children	-0.00387	0.02387	1.000	-0.0719	0.0641
		Couple w/o children	,08197*	0.01502	0.000	0.0392	0.1248
		Couple w/ children	-0.02849	0.01488	0.394	-0.0709	0.0139
		Living w/ roommates	-0.05570	0.04472	0.814	-0.1831	0.0717
		Living at home w/ parents	0.08353	0.04656	0.469	-0.0491	0.2162
	Single-parent household w/ children	Single-person household	0.00387	0.02387	1.000	-0.0641	0.0719
		Couple w/o children	,08584*	0.02186	0.001	0.0235	0.1481
		Couple w/ children	-0.02461	0.02177	0.869	-0.0866	0.0374
		Living w/ roommates	-0.05183	0.04745	0.885	-0.1871	0.0834
		Living at home w/ parents	0.08741	0.04919	0.481	-0.0528	0.2276
	Couple w/o children	Single-person household	-,08197*	0.01502	0.000	-0.1248	-0.0392
		Single-parent household w/ children	-,08584*	0.02186	0.001	-0.1481	-0.0235
		Couple w/ children	-,11045*	0.01139	0.000	-0.1429	-0.0780
		Living w/ roommates	-,13767*	0.04368	0.020	-0.2621	-0.0132
		Living at home w/ parents	0.00157	0.04556	1.000	-0.1283	0.1314
	Couple w/ children	Single-person household	0.02849	0.01488	0.394	-0.0139	0.0709

		Single-parent household w/ children	0.02461	0.02177	0.869	-0.0374	0.0866
		Couple w/o children	,11045*	0.01139	0.000	0.0780	0.1429
		Living w/ roommates	-0.02721	0.04363	0.989	-0.1516	0.0971
		Living at home w/ parents	0.11202	0.04552	0.136	-0.0177	0.2417
	Living w/ roommates	Single-person household	0.05570	0.04472	0.814	-0.0717	0.1831
		Single-parent household w/ children	0.05183	0.04745	0.885	-0.0834	0.1871
		Couple w/o children	,13767*	0.04368	0.020	0.0132	0.2621
		Couple w/ children	0.02721	0.04363	0.989	-0.0971	0.1516
		Living at home w/ parents	0.13923	0.06205	0.218	-0.0376	0.3161
	Living at home w/ parents	Single-person household	-0.08353	0.04656	0.469	-0.2162	0.0491
		Single-parent household w/ children	-0.08741	0.04919	0.481	-0.2276	0.0528
		Couple w/o children	-0.00157	0.04556	1.000	-0.1314	0.1283
		Couple w/ children	-0.11202	0.04552	0.136	-0.2417	0.0177
		Living w/ roommates	-0.13923	0.06205	0.218	-0.3161	0.0376
Work-Life Balance (Brough et al, 2009)	Single-person household	Single-parent household w/ children	0.010	0.028	0.999	-0.07	0.09
		Couple w/o children	-,199*	0.018	0.000	-0.25	-0.15
		Couple w/ children	0.016	0.017	0.937	-0.03	0.07
		Living w/ roommates	0.089	0.052	0.532	-0.06	0.24
		Living at home w/ parents	-0.092	0.055	0.546	-0.25	0.06
	Single-parent household w/ children	Single-person household	-0.010	0.028	0.999	-0.09	0.07
		Couple w/o children	-,209*	0.026	0.000	-0.28	-0.14
		Couple w/ children	0.007	0.026	1.000	-0.07	0.08

		Living w/ roommates	0.080	0.056	0.708	-0.08	0.24
		Living at home w/ parents	-0.101	0.058	0.496	-0.27	0.06
	Couple w/o children	Single-person household	,199*	0.018	0.000	0.15	0.25
		Single-parent household w/ children	,209*	0.026	0.000	0.14	0.28
		Couple w/ children	,215*	0.013	0.000	0.18	0.25
		Living w/ roommates	,288*	0.051	0.000	0.14	0.43
		Living at home w/ parents	0.107	0.053	0.335	-0.04	0.26
	Couple w/ children	Single-person household	-0.016	0.017	0.937	-0.07	0.03
		Single-parent household w/ children	-0.007	0.026	1.000	-0.08	0.07
		Couple w/o children	-,215*	0.013	0.000	-0.25	-0.18
		Living w/ roommates	0.073	0.051	0.714	-0.07	0.22
		Living at home w/ parents	-0.108	0.053	0.329	-0.26	0.04
	Living w/ roommates	Single-person household	-0.089	0.052	0.532	-0.24	0.06
		Single-parent household w/ children	-0.080	0.056	0.708	-0.24	0.08
		Couple w/o children	-,288*	0.051	0.000	-0.43	-0.14
		Couple w/ children	-0.073	0.051	0.714	-0.22	0.07
		Living at home w/ parents	-0.181	0.073	0.129	-0.39	0.03
	Living at home w/ parents	Single-person household	0.092	0.055	0.546	-0.06	0.25
		Single-parent household w/ children	0.101	0.058	0.496	-0.06	0.27
		Couple w/o children	-0.107	0.053	0.335	-0.26	0.04
		Couple w/ children	0.108	0.053	0.329	-0.04	0.26

		Living w/ roommates	0.181	0.073	0.129	-0.03	0.39
Exhaustion	Single-person household	Single-parent household w/ children	0.05669	0.02281	0.129	-0.0083	0.1217
		Couple w/o children	,14110*	0.01436	0.000	0.1002	0.1820
		Couple w/ children	,06426*	0.01423	0.000	0.0237	0.1048
		Living w/ roommates	-,12492*	0.04275	0.041	-0.2467	-0.0031
		Living at home w/ parents	-0.05922	0.04451	0.768	-0.1861	0.0676
	Single-parent household w/ children	Single-person household	-0.05669	0.02281	0.129	-0.1217	0.0083
		Couple w/o children	,08441*	0.02089	0.001	0.0249	0.1440
		Couple w/ children	0.00757	0.02081	0.999	-0.0517	0.0669
		Living w/ roommates	-,18161*	0.04536	0.001	-0.3109	-0.0523
		Living at home w/ parents	-0.11591	0.04702	0.135	-0.2499	0.0181
	Couple w/o children	Single-person household	-,14110*	0.01436	0.000	-0.1820	-0.1002
		Single-parent household w/ children	-,08441*	0.02089	0.001	-0.1440	-0.0249
		Couple w/ children	-,07684*	0.01089	0.000	-0.1079	-0.0458
		Living w/ roommates	-,26602*	0.04175	0.000	-0.3850	-0.1470
		Living at home w/ parents	-,20032*	0.04355	0.000	-0.3244	-0.0762
	Couple w/ children	Single-person household	-,06426*	0.01423	0.000	-0.1048	-0.0237
		Single-parent household w/ children	-0.00757	0.02081	0.999	-0.0669	0.0517
		Couple w/o children	,07684*	0.01089	0.000	0.0458	0.1079
		Living w/ roommates	-,18918*	0.04171	0.000	-0.3081	-0.0703
		Living at home w/ parents	-0.12348	0.04351	0.052	-0.2475	0.0005
	Living w/ roommates	Single-person household	,12492*	0.04275	0.041	0.0031	0.2467

		Single-parent household w/ children	,18161*	0.04536	0.001	0.0523	0.3109
		Couple w/o children	,26602*	0.04175	0.000	0.1470	0.3850
		Couple w/ children	,18918*	0.04171	0.000	0.0703	0.3081
		Living at home w/ parents	0.06570	0.05931	0.878	-0.1033	0.2347
	Living at home w/ parents	Single-person household	0.05922	0.04451	0.768	-0.0676	0.1861
		Single-parent household w/ children	0.11591	0.04702	0.135	-0.0181	0.2499
		Couple w/o children	,20032*	0.04355	0.000	0.0762	0.3244
		Couple w/ children	0.12348	0.04351	0.052	-0.0005	0.2475
		Living w/ roommates	-0.06570	0.05931	0.878	-0.2347	0.1033
Engagement Score (Schaufeli & Bakker, 2003)	Single-person household	Single-parent household w/ children	-,12358*	0.01903	0.000	-0.1778	-0.0694
		Couple w/o children	-,07721*	0.01197	0.000	-0.1113	-0.0431
		Couple w/ children	-,10218*	0.01187	0.000	-0.1360	-0.0684
		Living w/ roommates	0.01794	0.03565	0.996	-0.0837	0.1195
		Living at home w/ parents	-,12249*	0.03712	0.012	-0.2283	-0.0167
	Single-parent household w/ children	Single-person household	,12358*	0.01903	0.000	0.0694	0.1778
		Couple w/o children	0.04637	0.01743	0.083	-0.0033	0.0960
		Couple w/ children	0.02140	0.01735	0.821	-0.0281	0.0709
		Living w/ roommates	,14152*	0.03783	0.003	0.0337	0.2493
		Living at home w/ parents	0.00109	0.03922	1.000	-0.1107	0.1129
	Couple w/o children	Single-person household	,07721*	0.01197	0.000	0.0431	0.1113
		Single-parent household w/ children	-0.04637	0.01743	0.083	-0.0960	0.0033
		Couple w/ children	-0.02497	0.00908	0.066	-0.0509	0.0009

		Living w/ roommates	0.09515	0.03482	0.069	-0.0041	0.1944
		Living at home w/ parents	-0.04527	0.03632	0.814	-0.1488	0.0582
	Couple w/ children	Single-person household	,10218*	0.01187	0.000	0.0684	0.1360
		Single-parent household w/ children	-0.02140	0.01735	0.821	-0.0709	0.0281
		Couple w/o children	0.02497	0.00908	0.066	-0.0009	0.0509
		Living w/ roommates	,12012*	0.03479	0.007	0.0210	0.2193
		Living at home w/ parents	-0.02030	0.03629	0.994	-0.1237	0.0831
	Living w/ roommates	Single-person household	-0.01794	0.03565	0.996	-0.1195	0.0837
		Single-parent household w/ children	-,14152*	0.03783	0.003	-0.2493	-0.0337
		Couple w/o children	-0.09515	0.03482	0.069	-0.1944	0.0041
		Couple w/ children	-,12012*	0.03479	0.007	-0.2193	-0.0210
		Living at home w/ parents	-0.14043	0.04947	0.052	-0.2814	0.0005
	Living at home w/ parents	Single-person household	,12249*	0.03712	0.012	0.0167	0.2283
		Single-parent household w/ children	-0.00109	0.03922	1.000	-0.1129	0.1107
		Couple w/o children	0.04527	0.03632	0.814	-0.0582	0.1488
		Couple w/ children	0.02030	0.03629	0.994	-0.0831	0.1237
		Living w/ roommates	0.14043	0.04947	0.052	-0.0005	0.2814
Professional Isolation (Golden et al. 2008)	Single-person household	Single-parent household w/ children	0.06100	0.02261	0.075	-0.0034	0.1254
		Couple w/o children	,14021*	0.01423	0.000	0.0997	0.1808
		Couple w/ children	,06601*	0.01410	0.000	0.0258	0.1062
		Living w/ roommates	-0.09228	0.04236	0.248	-0.2130	0.0284
		Living at home w/ parents	0.07382	0.04410	0.549	-0.0519	0.1995

	Single-parent household w/ children	Single-person household	-0.06100	0.02261	0.075	-0.1254	0.0034
		Couple w/o children	,07920*	0.02070	0.002	0.0202	0.1382
		Couple w/ children	0.00500	0.02062	1.000	-0.0538	0.0638
		Living w/ roommates	-,15329*	0.04495	0.009	-0.2814	-0.0252
		Living at home w/ parents	0.01281	0.04659	1.000	-0.1200	0.1456
	Couple w/o children	Single-person household	-,14021*	0.01423	0.000	-0.1808	-0.0997
		Single-parent household w/ children	-,07920*	0.02070	0.002	-0.1382	-0.0202
		Couple w/ children	-,07420*	0.01079	0.000	-0.1050	-0.0435
		Living w/ roommates	-,23249*	0.04137	0.000	-0.3504	-0.1146
		Living at home w/ parents	-0.06639	0.04316	0.639	-0.1894	0.0566
	Couple w/ children	Single-person household	-,06601*	0.01410	0.000	-0.1062	-0.0258
		Single-parent household w/ children	-0.00500	0.02062	1.000	-0.0638	0.0538
		Couple w/o children	,07420*	0.01079	0.000	0.0435	0.1050
		Living w/ roommates	-,15829*	0.04133	0.002	-0.2761	-0.0405
		Living at home w/ parents	0.00781	0.04311	1.000	-0.1151	0.1307
	Living w/ roommates	Single-person household	0.09228	0.04236	0.248	-0.0284	0.2130
		Single-parent household w/ children	,15329*	0.04495	0.009	0.0252	0.2814
		Couple w/o children	,23249*	0.04137	0.000	0.1146	0.3504
		Couple w/ children	,15829*	0.04133	0.002	0.0405	0.2761
		Living at home w/ parents	0.16610	0.05877	0.053	-0.0014	0.3336
	Living at home w/ parents	Single-person household	-0.07382	0.04410	0.549	-0.1995	0.0519

	Single-parent household w/ children	-0.01281	0.04659	1.000	-0.1456	0.1200
	Couple w/o children	0.06639	0.04316	0.639	-0.0566	0.1894
	Couple w/ children	-0.00781	0.04311	1.000	-0.1307	0.1151
	Living w/ roommates	-0.16610	0.05877	0.053	-0.3336	0.0014

*. The mean difference is significant at the 0.05 level.

V.6 AT-HOME WORKSPACE AND HOUSEHOLD TYPE ON PRODUCTIVITY

(I) Physical Work Environment		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Furnished enclosed workspace	Furnished workspace in a shared room	,118*	0.024	0.000	0.06	0.18
	Enclosed non-furnished workspace	,173*	0.021	0.000	0.12	0.23
	Non-enclosed non-furnished workspace	,264*	0.020	0.000	0.21	0.32
Furnished workspace in a shared room	Furnished enclosed workspace	-,118*	0.024	0.000	-0.18	-0.06
	Enclosed non-furnished workspace	0.055	0.027	0.189	-0.02	0.13
	Non-enclosed non-furnished workspace	,146*	0.027	0.000	0.08	0.21
Enclosed non-furnished workspace	Furnished enclosed workspace	-,173*	0.021	0.000	-0.23	-0.12
	Furnished workspace in a shared room	-0.055	0.027	0.189	-0.13	0.02
	Non-enclosed non-furnished workspace	,091*	0.024	0.001	0.03	0.15
Non-enclosed non-furnished workspace	Furnished workspace in a shared room	-,264*	0.020	0.000	-0.32	-0.21
	Enclosed non-furnished workspace	-,146*	0.027	0.000	-0.21	-0.08
	Non-enclosed non-furnished workspace	-,091*	0.024	0.001	-0.15	-0.03

*. The mean difference is significant at the 0.05 level.

Household Type **Tukey HSD Post Hoc Test**

(I) Household Type		Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
					Lower Bound	Upper Bound
Single-person household	Single-parent household w/ children	-,110*	0.037	0.035	-0.21	0.00
	Couple w/o children	-,220*	0.023	0.000	-0.29	-0.15
	Couple w/ children	-,084*	0.023	0.003	-0.15	-0.02
	Living w/ roommates	0.161	0.069	0.182	-0.04	0.36
	Living at home w/ parents	-0.144	0.072	0.340	-0.35	0.06
Single-parent household w/ children	Single-person household	,110*	0.037	0.035	0.00	0.21
	Couple w/o children	-,110*	0.034	0.014	-0.21	-0.01
	Couple w/ children	0.025	0.034	0.976	-0.07	0.12
	Living w/ roommates	,270*	0.073	0.003	0.06	0.48
	Living at home w/ parents	-0.035	0.076	0.998	-0.25	0.18
Couple w/o children	Single-person household	,220*	0.023	0.000	0.15	0.29
	Single-parent household w/ children	,110*	0.034	0.014	0.01	0.21
	Couple w/ children	,135*	0.018	0.000	0.09	0.19
	Living w/ roommates	,381*	0.068	0.000	0.19	0.57
	Living at home w/ parents	0.076	0.070	0.892	-0.13	0.28
Couple w/ children	Single-person household	,084*	0.023	0.003	0.02	0.15
	Single-parent household w/ children	-0.025	0.034	0.976	-0.12	0.07
	Couple w/o children	-,135*	0.018	0.000	-0.19	-0.09
	Living w/ roommates	,245*	0.067	0.004	0.05	0.44
	Living at home w/ parents	-0.060	0.070	0.958	-0.26	0.14
Living w/ roommates	Single-person household	-0.161	0.069	0.182	-0.36	0.04
	Single-parent household w/ children	-,270*	0.073	0.003	-0.48	-0.06
	Couple w/o children	-,381*	0.068	0.000	-0.57	-0.19
	Couple w/ children	-,245*	0.067	0.004	-0.44	-0.05

	Living at home w/ parents	-,305*	0.096	0.018	-0.58	-0.03
Living at home w/ parents	Single-person household	0.144	0.072	0.340	-0.06	0.35
	Single-parent household w/ children	0.035	0.076	0.998	-0.18	0.25
	Couple w/o children	-0.076	0.070	0.892	-0.28	0.13
	Couple w/ children	0.060	0.070	0.958	-0.14	0.26
	Living w/ roommates	,305*	0.096	0.018	0.03	0.58

*. The mean difference is significant at the 0.05 level.

APPENDIX VI: LISREL 8.54 INPUT AND GOODNESS OF FIT STATISTICS

VI.1 LISREL 8.54 INPUT

DATE: 5/26/2021

TIME: 15:30

L I S R E L 8.54

BY

Karl G. Jöreskog & Dag Sörbom

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The following lines were read from file C:\Users\Thijs\Desktop\Thesis_WFH\12052021\PATH.SPJ:

SYSTEM FILE from file 'C:\Users\Thijs\Desktop\Thesis_WFH\12052021\PATH.DSF'

Sample Size = 24751

Relationships

NUM_MSK = SUPPORT NUM_SBS JOBSTRES NUM_DEPR EXHAU PROFISO

NUM_SBS = SUPPORT

JOBSTRES = SUPPORT NUM_SBS EXHAU PROFISO

WLB = SUPPORT JOBSTRES NUM_DEPR EXHAU ENGAG PROFISO

NUM_DEPR = NUM_SBS JOBSTRES EXHAU ENGAG PROFISO

EXHAU = SUPPORT NUM_SBS ENGAG PROFISO

ENGAG = SUPPORT NUM_SBS

PROFISO = SUPPORT NUM_SBS ENGAG

SELF_PER = SUPPORT NUM_SBS WLB NUM_DEPR EXHAU ENGAG PROFISO

SUPPORT = AGE_CON HIGH_EDU AHW_FUR AHW_ENCL HF_CHILD

NUM_MSK = FEMALE AGE_CON HIGH_EDU AHW_FUR

NUM_SBS = FEMALE AGE_CON HIGH_EDU AHW_FUR AHW_ENCL HF_CHILD

JOBSTRES = AGE_CON HIGH_EDU HF_CHILD

WLB = HIGH_EDU AHW_FUR AHW_ENCL HF_CHILD HF_LIVIN

NUM_DEPR = FEMALE AGE_CON HF_CHILD HF_LIVIN

EXHAU = AGE_CON HIGH_EDU AHW_FUR AHW_ENCL HF_CHILD

ENGAG = AHW_FUR AHW_ENCL HF_CHILD HF_LIVIN

PROFISO = AGE_CON HIGH_EDU AHW_FUR AHW_ENCL HF_CHILD HF_LIVIN

SELF_PER = FEMALE AGE_CON HIGH_EDU AHW_FUR AHW_ENCL HF_CHILD

Path Diagram

lisrel output

End of Problem

VI.2 LISREL 8.54 GOODNESS OF FIT STATISTICS

Goodness of Fit Statistics

Degrees of Freedom = 29
Minimum Fit Function Chi-Square = 140.57 (P = 0.00)
Normal Theory Weighted Least Squares Chi-Square = 140.81 (P = 0.00)
Estimated Non-centrality Parameter (NCP) = 111.81
90 Percent Confidence Interval for NCP = (78.53 ; 152.62)

Minimum Fit Function Value = 0.0057
Population Discrepancy Function Value (F0) = 0.0045
90 Percent Confidence Interval for F0 = (0.0032 ; 0.0062)
Root Mean Square Error of Approximation (RMSEA) = 0.012
90 Percent Confidence Interval for RMSEA = (0.010 ; 0.015)
P-Value for Test of Close Fit (RMSEA < 0.05) = 1.00

Expected Cross-Validation Index (ECVI) = 0.016
90 Percent Confidence Interval for ECVI = (0.014 ; 0.017)
ECVI for Saturated Model = 0.012
ECVI for Independence Model = 5.44

Chi-Square for Independence Model with 136 Degrees of Freedom = 134471.02
Independence AIC = 134505.02
Model AIC = 388.81
Saturated AIC = 306.00
Independence CAIC = 134660.00
Model CAIC = 1519.27
Saturated CAIC = 1700.84

Normed Fit Index (NFI) = 1.00
Non-Normed Fit Index (NNFI) = 1.00
Parsimony Normed Fit Index (PNFI) = 0.21
Comparative Fit Index (CFI) = 1.00
Incremental Fit Index (IFI) = 1.00

Relative Fit Index (RFI) = 1.00
Critical N (CN) = 8732.21

Root Mean Square Residual (RMR) = 0.0033
Standardized RMR = 0.0054
Goodness of Fit Index (GFI) = 1.00
Adjusted Goodness of Fit Index (AGFI) = 1.00
Parsimony Goodness of Fit Index (PGFI) = 0.19