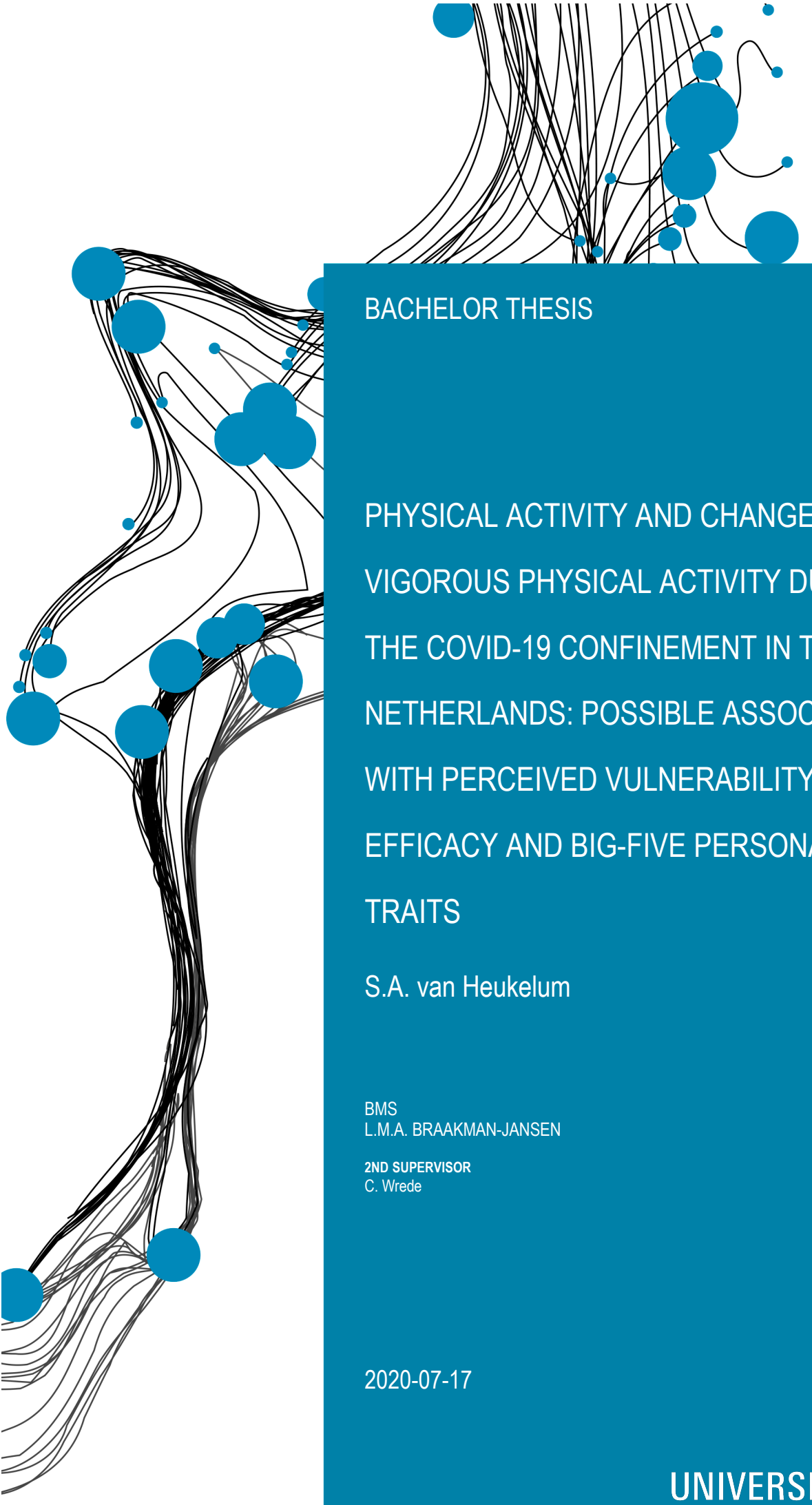

BACHELOR THESIS

PHYSICAL ACTIVITY AND CHANGE IN VIGOROUS PHYSICAL ACTIVITY DURING THE COVID-19 CONFINEMENT IN THE NETHERLANDS: POSSIBLE ASSOCIATIONS WITH PERCEIVED VULNERABILITY, SELF-EFFICACY AND BIG-FIVE PERSONALITY TRAITS

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Abstract

Background: Due to the Covid-19 measurements, Dutch citizens are requested to stay home as much as possible. Although this is necessary to contain the virus, it influences the amount of physical activity. Physical activity has a high impact on health and is therefore important. In this study the extent to which participants are compliant with the norm of healthy exercise is researched, as well as the change in vigorous physical activity since the beginning of the Covid-19 confinement. Perceived vulnerability, self-efficacy towards physical activity and the Big-Five personality traits are measured to search for associations with the amount of physical activity during confinement and the change in vigorous physical activity since confinement.

Methods: A cross-sectional design was used. The questionnaire measured physical activity (International Physical Activity Questionnaire, IPAQ), personality (Ten Item Personality Measurement, TIPI), perceived vulnerability (Perceived Vulnerability towards Disease Questionnaire, PVDQ) and self-efficacy towards 150 minutes per week of physical activity (Self-Efficacy Questionnaire, SEQ). Snowball sampling was used to spread the questionnaire. Descriptive analyse was used to describe the amount of physical activity. Spearman's correlation was used to explore the correlation of the amount of physical activity and the change in vigorous physical activity since the confinement of Covid-19 with perceived vulnerability, self-efficacy and personality.

Results: Results shows that of the 488 respondents, the majority of the sample (53.3%) conformed with the norm of healthy exercise. The amount of physical activity increased from a median (range) Metabolic Equivalent scores (MET-scores) of vigorous physical activity of 720 (1440) previous to the confinement to 5720 (1920) during the Covid-19 confinement, but not significantly ($p=.097$). Walking did however significantly ($p=.000$) increase. The amount of physical activity was positively and significant ($p<0.01$) associated with conscientiousness ($r=.126$) and self-efficacy ($r=.145$). The change in vigorous physical activity was negatively and significantly ($p<0.05$, one-tailed) associated with perceived vulnerability ($r = -.082*$).

Conclusion: It is concluded that a negative impact of the Covid-19 confinement on the amount of physical activity is not found in this research. However, further policy and interventions should focus on individuals who score high on perceived vulnerability and low on self-efficacy towards physical activity to promote physical activity during future confinements and provide help to increase self-efficacy and lower perceived vulnerability.

Introduction

In December 2019, a new pandemic started in China. Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) causes the infectious Corona disease 2019, abbreviated as 'COVID-19' (WHO, 2020a). Worldwide, more than 4,5 million cases have been reported and more than 300 thousand people died from the virus (WHO, 2020a, 19th of May). Fever, dry cough and tiredness are the most common symptoms, which are similar to the common flue. Although most people experience mild symptoms of Covid-19, 20% of all infected people worldwide end up in the hospital, due to pneumonia, which can be fatal (WHO, 2020b). In 2018 around 1200 people in the Netherlands died from the common influenza, while the coronavirus already killed 6 thousand people, which makes the coronavirus more dangerous (CBS, 2019; RIVM, 2020a, 19th of May). Elderly people or adults with certain diseases like diabetes are at higher risk of becoming ill due to a lower function of the immune system (RIVM, 2020b). In order to prevent more people from being infected, isolation is obligated, but this has serious side effects for mental and physical health.

Due to the rapid spread of the virus, measures are taken around the world, to slow down the spread of the virus in order to prevent the health system to outreach capacity (RIVM, 2020c). Although all measurements focus on social distancing and lockdowns, countries differ in their approach. Whereas Italian citizens are in strict lockdown, Belgian citizens are allowed to go outside for a walk (Governo Italiano, 2020; FOD, 19th of March, 2020). In the Netherlands, the main measures that citizens must follow are 1,5 meter distance from others and if possible stay home, which is called an 'Intellectual Lockdown' (RIVM, 2020c). Furthermore, if one displays symptoms of fever, a cold or a sore throat, one must stay at home. While these measurements are necessarily to contain the virus, they have a major effect on the daily lives of humans, social and physical. Social isolation is associated with cardiovascular and neurocognitive problems as well as mental problems, like anxiety and depression (Leigh-Hunt, et al., 2017; Herbolsheimer, Ungar & Peter, 2018; Armitage & Nellums, 2020). After the Sars-1 outbreak in 2003, the quarantine of health workers in China was associated with increased PTSD symptoms (Wu et al., 2009). Beside these mental consequences, the measurements might lead to physical inactivity (Lippi, Henry, Bovo, & Sanchis-Gomar, 2020).

Physical inactivity has major effects on health. Weight gain is one of the most significant consequences of physical inactivity, which can lead to obesity or other diseases (Pietiläinen et al., 2008). Regular physical activity is associated with a better immune system, which is important to fight diseases like Covid-19 (Moro-García et al, 2014). Physically active elderly

are (among others) at reduced risk of stroke, diabetes mellitus, cancer, osteoporosis, ADL disability, dementia and depression (Cunningham, O'Sullivan, Caserotti & Tully, 2020).

The Dutch 'Gezondheidsraad' has stated a guideline for healthy physical activity (Gezondheidsraad, 2017). According to this guideline, which is called the norm for healthy exercise, all adults and elderly should engage in moderate to vigorous physical activity for at least 150 minutes per week, and besides this, also do muscle exercises two times a week. This is a minimum in order to stay healthy. The previous norm made a distinction between moderate and vigorous physical activity (Kemper, Ooijendijk & Stiggelbout, 2000), but with the new norm, this difference has vanished for adults, since the 'gezondheidsraad' (2017) has found no scientific proof that there must be a distinction. According to Zantinge, & Jager (2020) in total 49,1% of the Dutch adults were compliant with the new guidelines in 2019, declining from 55,9% between 18-34 to 40,3% of the elderly (65+).

There are different determinants involved in whether an individual performs a certain behaviour or not. According to the Social Cognitive Theory (SCT), behaviour is the outcome of an interaction between behavioural factors, social factors and personal factors (Bandura, 1997). Behavioural factors include 'outcome expectancies', which is the expected reward after certain behaviour. Social support is part of social factors, which means that behaviour can be encouraged or uphold by family and friends. Personal factors include self-efficacy, which is illustrated as an individual's belief in competency to do something (Bandura, 1997). All those factors interact to enhance or discourage certain behaviour.

Many determinants have been found to enhance or discourage physical activity. Bauman (2012) has found a positive association between self-efficacy and physical activity, which means that if an individual believes that he is able to be physical activity, there is a higher probability that he is actually physical active. Hildebrandt, Chorus, Hendriksen, & Van Mechelen (2011) found that age, education and employment were associated with physical (in)activity in the Netherlands, since elderly, lower educated or unemployed individuals showed higher levels of physical inactivity.

However, the Covid-19 confinement is a new situation in the Netherlands. The message of the government is to stay at home to remain healthy, especially the vulnerable individuals. When staying home as much as possible, the chance of being infected by the virus decreases. Individuals who perceive themselves as vulnerable to the virus, will stay home more often, in order to minimalize the threat. However, staying home all day is expected to lower the physical activity.

Performing certain behaviour is also often influenced by the personality of individuals, measured by the Big Five personality traits (neuroticism, extraversion, conscientiousness, openness to experience and agreeableness. Hearon and Harrison (2020) found that the 'agreeableness' is associated with less physical activity, and Karyonen, Tormakangas, Pulkkinen and Kokko (2020) found a positive association between extraversion and physical activity. Research also showed that low levels of neuroticism is associated with higher levels of physical activity (Smith, Williams, O'Donnell, & McKechnie, 2017). In despite of this, research shows also that personality affects dealing with threats, like a virus. For example, in a study about stressful events, higher neuroticism and lower extraversion were related to greater maladjustment (Riolli, Savicki, Cepani, 2002).

Since the confinement of Covid-19 brings a new situation to the Netherlands, there has not been research on many factors which are associated with the physical activity of the Dutch population during the confinement. An accurate understanding of determinants associated with physical activity accompanying the Covid-19 lockdown is important to know to for interventions to promote physical activity. Therefore, in this research the factors self-efficacy, perceived vulnerability and personality are assessed.

This study will explore

1) the extent to which participants are compliant with the norm of healthy exercise during the Covid-19 confinement in the Netherlands;
2) the change in vigorous physical activity before and during the Covid-19 confinement in the Netherlands;
3) to what extent the actual psychical activity and the change in vigorous physical activity are associated with perceived vulnerability, self-efficacy and personality.

It is hypothesized that there is a decline in vigorous physical activity since the confinement due to Covid-19. Furthermore, we hypothesize that high perceived vulnerability, low self-efficacy towards physical activity and a high score on the Personality trait neuroticism are negatively associated with physical activity.

Methods

Design

A cross sectional online survey was composed to explore the amount of physical activity in Dutch individuals and the change in vigorous physical activity since the confinement of Covid-19, as well as possible associations with self-efficacy, perceived vulnerability and personality.

Participants

Eligible respondents were adults (>18 years) who live in the Netherlands and have a proficient understanding of Dutch. Participants who did not meet this criterion were excluded.

To check the power and needed sample size, the program g*power was used. Since there are many variables associated with physical activity, a small effect size (d=.2) is assumed (see Cohen, 1988). Taking the Pearson r's as statistic test, this was resulting in sample sizes n = 396 with a power of .80, α err probability of 0.05, 2 sided-tested. Therefore, the sample size must be at least 396 to reach a power of .80.

Participants were recruited by sharing the link of the survey on social media and according to non-probability sampling. More specifically, since the message at social media was shared by many people, snowball sampling was used to gain participants. All respondents participated voluntary and were informed prior to participation and signed a consent form.

Materials

The questionnaire contained special measurement tools, namely the IPAQ, TIPI, Intention scale, Self-efficacy scale and Perceived vulnerability scale.

Sociodemographics

Demographics like age, gender, education and work situation were gathered. Education was divided into three groups: low (primary or secondary education), middle (lower & middle professional education) and higher education (University of applied science & University). Work situation was divided into working, voluntary work, unemployed, students and others.

Actual physical activity

To measure the current psychical activity, the IPAQ-SF was used (Craig, Marshall, Sjostrom, Bauman, Booth, Ainsworth, 2003). It consists of seven questions. Specific types of physical activity were assessed, namely low-intensity, moderate-intensity and vigorous-intensity

activities. An example question for vigorous-intensity activity was “During the last seven days on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?”. The respondents answered by filling in the amount of hours and minutes. With this information, Metabolic Equivalent scores (MET-scores) were calculated. MET is related to the amount of oxygen required by the body for a given activity (Sanghvi, 2013). One MET stands for one’s estimated energy consumption during rest (Forde, n.d.). Research found that low physical activity minutes weigh as 3.3 METS, moderate physical activity as 4 METS and vigorous physical activity as 8 METS. To calculate a subscale score, for example moderate physical activity, minutes of activity are multiplied by days by the weight of the activity in MET. A total MET-score can be calculated by adding the low intensity MET-score, moderate intensity MET-score and vigorous intensity MET-score. Test-retest Spearman’s reliability for the Dutch IPAQ-SF was 0.85 and Criterion validity was 0.32 (Craigh et al., 2003).

Vigorous physical activity

In order to compare the amount of vigorous physical activity before and during the Covid-19 confinement, the amount of vigorous physical activity before the confinement was asked by the question “what kind of sports did you perform before the Covid-19 isolation and how many minutes per week”. Sport activity is seen as vigorous physical activity and therefore those minutes were multiplied by 8.0 to gain a MET-score of vigorous physical activity. In order to see whether the kind of sports has been changed, a second question was “what kind of sports do you currently perform”? A last question was “In what amount do the Covid-19 social distancing measurements hinder your usual sport activity”, with a scale from “0 = not at all” to “5 = very much”.

Personality

The TIPI is a 10-item measurement for personality, made by Gosling, Rentfrow and Swann (2003). The Dutch version of Hofmans, Kuppens, and Allik (2008) was used. The items contain statements about the Big Five personality traits. An example item is “fearful, easily upset”, where participants had to indicate whether this was like them or not at all, with 7-point scale. Five questions have a reversed score (Q2,4,6,8,10). The scale score was calculated by adding the scores (or reversed scores) that belonged to the scale and dividing this by 2. The scale ‘Extraversion’ contained item 1 and 6 (R), ‘Agreeableness’ contained item 2 (R) and 7,

‘Conscientiousness’ contained item 3 and 8 (R), ‘Emotional Stableness’ contained 4 (R) and 9 and lastly, ‘Openness to Experiences’ contained item 5 and 10 (R).

The Dutch version of the TIPI was tested with a good validity (Hofmans, Kuppens, & Allik, 2008). Cronbach’s alpha was .72 for Extraversion, .32 for Agreeableness, .48 for Conscientiousness, .58 for Emotional Stableness and .37 for Openness to Experiences. While these scores were rather low, they were coherent with the English version (Gosling, Rentfrow & Swann, 2003). The low scores were reasonable since there are only 2 items per dimension.

Self-efficacy towards physical activity

A Dutch version (Steven et al., 2001) of the Self-efficacy Questionnaire (McAuly, 1990) was used to estimate self-efficacy for physical activity. The questionnaire contains 7 items, with a 5 point scale from “1 = strongly disagree” to “5= strongly agree”. An example item is “I am confident that I can be physically active or exercise even when I am tired”. Cronbach’s Alpha was .91. The total score was the sum of all the scores. A higher score meant a higher self-efficacy towards physical activity.

Perceived vulnerability

Included in this survey was the Perceived Vulnerability to Disease self-report Questionnaire (PVDQ) to assess the perceived vulnerability to the Covid-19 virus. The PVDQ was originally an English questionnaire (Duncan, Schaller, & Park, 2009). A translation to Dutch from Reijerink was used (2017).

The PVDQ has 15 items, with a 7-point scale from “1 = strongly disagree” to “7 = strongly agree”. Six items were reversed scored. The survey consists of two constructs: Germ aversion (8 items) and Perceived Infectability (7 items). The emotional discomfort towards disease-connoting situations was measured by Germ Aversion. It predicts the reaction based on someone’s intuitive assessment of the disease transmission risk. An example item of this construct is: “I am comfortable sharing a water bottle with a friend” (reversed scored).

The second construct, Perceived Infectability, measured beliefs about the functioning of the immune system and of one’s own susceptibility to infectious diseases. An example item is “I have a history of susceptibility to infectious disease.” Items 3, 5, 11, 12, 13 and 14 have a reversed score. The final score was calculated by adding the scores (or reversed scores). A higher total score meant a higher perceived vulnerability to diseases.

Cronbach's Alpha in the Dutch version was for the subscale Germ Aversion α = .67 and .87 for Perceived Infectability (Reijerink, 2017).

Procedure

The BMS ethics committee of the University of Twente approved this research. The spread of the survey started at the 16th of April 2020. Respondents were given the questionnaire by use of the platform 'Qualtrics'. They were informed prior to participation about the purpose of the research and that no right or wrong answers could be given. Furthermore, it was stated that they participated voluntary and that they could stop at any given time. Participants who consented, completed the online survey. To fulfil the survey, the participants were occupied for fifteen minutes. After finishing the questionnaire, they could send the researcher an email to indicate interest in the result of the study.

Data analysis

To analyse the data, the statistical program IBM SPSS, version 25 was used. All respondents who did not finish the IPAQ-SF were excluded from the dataset. In addition, participants with an age under 18 were excluded. The rest of participants were involved in the analysis. At the IPAQ, some participants filled in an ambiguous answer, like '30 á 45 minutes'. In those cases, the lowest amount was taken.

In order to confirm with the norm of healthy exercise, individuals must engage in 150 minutes of moderate or vigorous physical activity. This is equal to 600 MET-minutes. A dichotomized MET-score was made and the cut off value was 600 MET-minutes. If an individual has a MET-score higher than 600 MET-minutes or more, he is confirm with the norm of healthy exercise. The norm of healthy exercise also entails two muscle/strength trainings per week, but this was not taking into the statistical analyse.

Delta-scores were calculated only for the difference between vigorous physical activity during the confinement (as measured by the IPAQ) and vigorous physical activity before confinement (as measured by minutes playing sport per week), since there is no Total Met-Score before confinement measured in the questionnaire.

All continuous variables were checked to see whether they were linear and normal distributed by using a scatterplot and the Shapiro Wilk test. Descriptive analyses were conducted of the participant's age, gender, education, working situation, health and amount of time outside the house. Also, the Total MET-score, the vigorous MET-score during confinement, the vigorous MET-score before confinement, frequencies of different sports performed before and during

confinement, and the extent to which participants were hindered by Covid-19 in their sports performances were assessed. Lastly, descriptive analysis of personality, perceived vulnerability and self-efficacy was performed. For nominal and ordinal variables, frequencies and percentages were calculated. For scale variables, the mean and standard deviation were calculated if the data was normal distributed. If the data was not normal distributed, the median and interquartile rate were calculated.

To examine whether participants were compliant with the norm of healthy exercise, frequencies of the dichotome variable MET-scores were calculated. Furthermore, to assess the difference between vigorous physical activity before and during the confinement, a paired sample t-test was used, when normally distributed. When not normally distributed, the Wilcoxon signed-rank test was used. Also for low physical activity, measured as walking, a paired sample t-test was used, if normally distributed, to assess differences between scores before and during confinement. When not normally distributed, the Wilcoxon signed-rank test was used. Lastly, Pearson's correlation tests were calculated for personality, perceived vulnerability and self-efficacy to examine correlations with actual physical activity and the change in vigorous physical activity. If the dependent variables were not normally distributed, Spearman's correlation was used.

Results

The total sample size included 558 participants of whom 488 were older than 18 and had completed the IPAQ and were therefore included in further analyses. Table 1 shows that 27% is male and 72% is female, with a median age of 40 years (IQR = 27). The majority of the sample attended higher education (64%). The sample consisted mostly of employees (64%) and students (22%). Of 488 participants, 3 individuals were displaying symptoms of the Covid-19 virus and 27 respondents had other health issues, like hay fever, injuries and chronical illnesses. Of all respondents, 17% did not leave their house in the last weeks. The respondents scored somewhat higher at agreeableness, but the differences per scale were not outstanding. The sample scored not particular high (mean = 53 out of a maximum possible score of 105) on perceived vulnerability, with a mean of 53 (sd = 12.4), nor on self-efficacy, with a median of 22 (7).

Table 1 Demographic characteristics. N=488.

		Frequency	**%**
Gender	Male	133	27
	Female	353	72
	Other	2	0
Education	Low	58	12
	Middle	118	24
	High	312	64
Employment*	Employed	377	77
	Voluntary work	41	8
	Unemployed	29	6
	Student	109	22
	Other	42	9
Health	Healthy	458	94
	Covid-19 symptoms	3	1
	Other	27	6
Going outside	Only in/around house	84	17
	Work	198	41
	Sports	294	60
	Others	379	78

		Mean	**SD**	**Median**	**IQR**
Age				40	27
Personality	Extraversion			5	2
	Agreeableness			5.5	1.5

	Conscientiousness			5	1.5
	Emotional stableness			5	1.5
	Openness			5	2
Perceived vulnerability		53	12.4		
Self-efficacy towards PA				22	7

*Note: IQR = Interquartile range. SD = Standard Deviation. PA=Physical Activity. *Multiple answers were possible. Personality = the Big five personality traits. Perceived vulnerability = Perceived vulnerability towards diseases.*

Physical activity before and during confinement

The sample group was highly physically active, with a median (range) MET-score of 2219 (3078), as displayed in Table 2. During the confinement, 53% of all participants were confirm to the norm of healthy exercise. The median (range) MET-score of vigorous physical activity increased, but not significantly (p=.097), from 720 (1440) previous to the Covid-19 confinement to 5720 (1920) during the confinement. Despite the fact that there is no significant difference in amount of vigorous activity, there seems to be a trend of increase in sports outside. Furthermore, there is a significant increase in individuals walking since the Covid-19 confinement. However, respondents were highly hindered in their usual vigorous physical activities by Covid-19 (median = 4, IQR = 4). Since the confinement of Covid-19, more respondents run and walk, while cardio inside declines. Less people indicate not to sport at all.

Table 2 Physical activity previously to Covid-19 confinement and actual psychical activity. N=488.

	Before confinement		**During confinement**		
	Median	**IQR**	**Median**	**IQR**	***P***
Total PA			2219.5	3078	
Vigorous PA	720	1440	5720	1920	.097
Hindered in vigorous PA by Covid-19			4	4	
	N	**%**	**N**	**%**	
Confirm to the norm for healthy exercise*			260	53.3	
Sports**					
Low physical activity					
Walking	242	49.6	363	74.4	.000*

Vigorous physical activity				
Running	85	17.6	121	24.8
Skating	13	2.7	27	5.5
Cycle racing/ mountain biking	39	8	52	10.7
Cardio inside	138	28.3	90	18.4
Strength/muscle training	76	15.6	108	22.1
Contact sport outside	23	4.7		
Contact sport inside	75	15.4		
Others	108	22.1	138	28.3
Not sporting	60	12.3	42	8.6

*Note: IQR = Interquartile range. PA=Physical activity. *as measured by 150 minutes of moderate and vigorous physical activity. **multiple answers were possible.*

Associated factors with physical activity

As displayed in Table 3, a significant correlation was found between actual physical activity and the personality trait "conscientiousness" (Rs=.126, p<0.01), which is a small positive correlation. Therefore, respondents who are scoring high in neatness are slightly more physically active than respondents scoring rather low. There is also a significant correlation found between actual physical activity and self-efficacy (Rs=.145, p<0.01), which means that respondents scoring high on self-efficacy towards physical activity are also slightly more physically active than those scoring low on self-efficacy. Perceived vulnerability was only negatively correlated with the change in vigorous physical activity since confinement, which means that individuals that perceived themselves as vulnerable, engaged in less vigorous physical activity.

Table 3 Spearman's correlation between actual physical activity and changed vigorous physical activity and personality, perceived vulnerability and self-efficacy.

	Physical activity	**Change in vigorous PA**
Personality (N=454)		
Extraversion	.066	.033
Agreeableness	-.026	.073
Conscientiousness	.126**	.088
Emotional stableness	0.076	.050
Openness to experiences	-.015	.029
Perceived vulnerability (N=448)	-.063	-.082*
Self-efficacy towards physical activity (N=461)	.145**	.005

*Note. PA = Physical activity. * p < 0.05 (one-tailed) **p < 0.01. Personality = Big-Five personality traits. Perceived vulnerability = Perceived Vulnerability towards Diseases.*

Discussion

This study explored the amount of physical activity during the Covid-19 confinement in the Netherlands. It showed that the majority of the respondents met the minimal advised physical activity during the Covid-19 confinement. The results do not support our first hypothesis, since there is an increase (but not significant) in vigorous physical activity since the beginning of the confinement. The Big Five personality trait 'conscientiousness' and Self-efficacy towards physical activity were found to be significantly associated with physical activity during confinement. Therefore, our hypothesis that low self-efficacy towards physical activity was negatively associated with physical activity was proven. Perceived vulnerability was found to be associated with the change in vigorous physical activity. However, possessing a neurotic personality was not associated with physical activity before nor during confinement.

Previous research has shown that 49,1% of the Dutch adults were compliant with the norm for healthy exercise in 2019 (Zantinge & Jager, 2020), which is quite similar to our result. Since respondents were highly hindered by Covid-19 in their usual sports, as team sports were not allowed and gyms were closed, it became harder to be physical active. Therefore, it was unexpected that the amount of vigorous physical activity did not decrease since the Covid-19 confinement. The frequency of walking individuals did significantly increase, which means that more individuals walked during the Covid-19 confinement than before the confinement. More people might go for a walk after a long day of working inside the house. While this research has focused on the norm of healthy exercise, another important factor is sedentary behaviour. Even if adults meet the norm of healthy exercise, sitting for a long period of time can result in metabolic health issues (Owen, Healy, Matthews, & Dunstan, 2010). Since the Covid-19 confinement prevents individuals from leaving the house, more sedentary behaviour is expected. Amongst American college students, more sedentary behaviour was observed during the Covid-19 confinement relative to the previous semesters (Huckins, et al., 2020). Prolonged sedentary behaviour can be harmful and, on that account, it is important to take regular breaks (Owen, et al., 2010).

Research on the influenza A (H1N1) pandemic in the Netherlands in 2009 found that perceived vulnerability was positively linked to conformation to the protective measurements of the government (Van der Weerd, Timmermans, Beaujean, Oudhoff, & van Steenbergen, 2011). This might explain why in this research perceived vulnerability was negatively associated with the change in vigorous physical activity since the Covid-19 confinement. The measurements of the government during the Covid-19 confinement included to stay home whenever possible, which was expected to lower the amount of physical activity. This measurement of the

government was intended to protect the vulnerable individuals and for that reason it was rightful that vulnerable individuals stay at home. However, the side effect is that individuals who perceive themselves as vulnerable, participate in little physical activity. Physical inactivity has a negative impact on the immune system (Moro-García et al, 2014) and therefore, individuals with low physical activity become increasingly vulnerable to the virus.

The finding that self-efficacy towards physical activity is related with physical activity is in line with a study of Tang and Wong (2005), whom found that in Chinese elderly self-efficacy towards SARS preventive behaviours, like physical activity, was related with these behaviours. It thus matter whether individuals belief that they are able to be physically active. Although the association between self-efficacy and physical activity was already known (see Sallis & Owen, 1998), this study indicates that this association remained of significant importance during the Covid-19 confinement.

Noticeable was that neuroticism was not significantly associated with physical activity, but only conscientiousness. Research by Smith, Williams, O'Donnell and McKechnie (2017) found a significant effect for neuroticism on physical activity, but not for conscientiousness. However, research of McEachan, Sutton and Myers (2010) suggested that conscientiousness did had significant effects on actual physical activity. The current research was conducted during the Covid-19 confinement, which might explain the differences in findings. Conscientiousness is associated with obedience (see Bègue et al., 2015), which could hold that besides the measurements of the government due to Covid-19, individuals are also likely to be obedient to the norm of healthy exercise. Neurotic individuals in the contrary are often scared and passive and, on that account, more likely to avoid going outside, thereby participating in less physical activity.

This study had some limitations. First, the IPAQ-SF was used to measure the actual physical activity, but not previous activity. Therefore, only the change in vigorous physical activity was measured. This was done to let the questionnaire length remain at a decent length, but this might have given a distorted result, since the two variables, vigorous physical activity before and during confinement, were measured by two different methods. Besides this, the IPAQ-SF is a self-reported questionnaire, which might give an overestimated or underestimated score. An observed score by a smartwatch that measured physical active minutes would be more accurate. Secondly, the study sample consisted mainly of females and higher educated respondents, which is not representative for the Dutch population and this limits generalizability of the findings. Thirdly, this study did not check for differences between healthy and non-healthy respondents. The general aim of the study was to research the amount of physical activity during

the Covid-19 confinement and therefore, no one was excluded based on health symptoms. It might have been that people with hay fever stayed in home more often, which affected the results: staying home is expected to lead to less physical activity. However, the impact is expected to be small, since it is a small part of the sample size.

The study also has some strong points, including a relatively large sample size. The questionnaire was spread at a moment in time where the first few weeks of Covid-19 were over, which included that people had time to adjust their physical activities to the new situations, but no easings were tolerated yet. In addition to this, the size of the sample is adequate to reach a power of .80, which was intended. This means that the sample size is big enough to measure the expected effect. The effect size of .2 was taking into account, which is considered to be a small effect size, but there is a possibility that the effect is even smaller than .2. This could be a reason why we did not find an effect for certain factors.

The results of this study point out that during a future confinement, it is important to focus on perceived vulnerability and self-efficacy in order to promote physical activity. This is relevant for policy makers and intervention designers. Although it is important to protect individuals, which implies staying home as much as possible, it is also important to keep promoting physical activity in order to remain healthy with a strong immune system. The majority of the sample size was higher educated, but it is unknown how the confinement affected physical activity for lower educated individuals. It might be that higher educated individuals perceive the message of the government 'stay at home' differently than lower educated citizen. Higher educated individuals have more knowledge about the working of the virus and can decide for themselves more easily whether it is safe to go outside. Therefore, interventions should be made to influence the individuals whom perceive themselves as vulnerable or not able to be physically active, while they are not part of the risk group, in order to activate them during a future pandemic. The government should be more precise in their advice to stay home by also advising in safe ways for physical activity. Furthermore, the vulnerable individuals who are part of the risk group, should be motivated for physical activity as well, by providing help how to be physically active without danger. This could be, for example, an online sport coach helping during workouts at home.

Further studies could focus on a representative sample size in order to be able to say something about the amount of physical activity of the Dutch population during the Covid-19 pandemic. This could be achieved by probability sampling methods, like cluster sampling. In addition, new research should compare actual physical activity with previous physical activity in terms of a longitudinal study, in order to have a stronger conclusion. Lastly, more elaborate research

is needed to find more clear results on the association between the Big-five personality traits and physical activity during Covid-19 confinement. It might help to use a different measurement for the Big-five personality traits than the TIPI, since this is only a short form which measures the basic features of the traits, but not into depth. This future research will enrich the information that is available about physical activity during a pandemic.

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Bijlage 1

Beweging tijdens quarantaine Covid-19

Start of Block: Geinformeerde toestemming

Q1 **Geinformeerde toestemming** Door het meedoen aan deze vragenlijst, bevestigt u dat u de volgende tekst hebt gelezen en ermee eens bent. Deze vragenlijst duurt ongeveer 15 minuten en heeft als doel om fysieke activiteiten te onderzoeken tijdens deze quarantaine door Covid-19 (Coronavirus) en daarnaast een aantal mogelijke determinanten die hierbij horen. Dit onderzoek is bedoelt voor volwassenen in Nederland.Lees de vragen zorgvuldig en neem de tijd om ze te beantwoorden. Er zijn geen goede of foute antwoorden, dus beantwoordt ze zoals ze passen bij uw situatie. Meedoen aan dit onderzoek is volledig vrijwillig. Daarom is het aan u om te beslissen om mee te doen of niet. Als u meedoet, heeft u het recht om de vragenlijst op elk moment te beëindigen, zonder consequenties. Alle verzamelde informatie wordt gebruikt in een onderzoek door een derde jaars psychology student aan de Universiteit van Twente en haar supervisor. Als de resultaten gepubliceerd zullen worden of op een andere manier publiekelijk gemaakt zal worden, zullen alle data compleet anoniem gemaakt worden. Uw persoonlijke data zullen niet aan derde partijen gedeeld worden zonder uw toestemming. Als u verdere informatie wilt over het onderzoek, voelt u vrij om te mailen naar het onderzoeksteam via s.a.vanheukelum@student.utwente.nl. Als u klachten heeft over dit onderzoek, neem onmiddellijk contact op met het secretariaat van de Ethische Commissie of de “Behavioural, Management and Social Sciences” factulteit. Alvast bedankt voor uw deelname.

- ○ Door het meedoen aan dit onderzoek ga ik akkoord met bovenstaand

End of Block: Geinformeerde toestemming

Start of Block: Demografie

Q2 Wat is uw geslacht?

- ○ Man
- ○ Vrouw
- ○ Anders

Q3 Wat is uw leeftijd?

_____

Q4 Wat is uw hoogst genoten opleiding?

- ○ Basisschool
- ○ Middelbare school (MAVO, MULO, HAVO, VWO, VMBO enz.)
- ○ Lager beroepsonderwijs (LTS, LEAO, LHNO enz.)
- ○ Middelbaar beroepsonderwijs
- ○ Hoger beroepsonderwijs
- ○ Universitair onderwijs

*

Q5 Inclusief uzelf, met hoeveel mensen woont u momenteel in een huis?

_____

Q6 Wat is de samenstelling van uw huishouden?

- ○ Alleenwonend
- ○ Tweepersoonshuishouden zonder (thuiswonende) kinderen
- ○ Eénoudergezin, jongste thuiswonende kind onder de 12 jaar
- ○ Eénoudergezin, jongste thuiswonende kind 12 jaar of ouder
- ○ Gezin, jongste thuiswonende kind onder de 12 jaar
- ○ Gezin, jongste thuiswonende kind 12 jaar of ouder
- ○ Groepswonen (bijv. studentenwoning)

Q10 Hoeveel kamers bevat het huis (Badkamer & wc niet meegerekend)

_____

Q7 Waar woont u?

- ○ Stad-centrum
- ○ Rand van de stad
- ○ Dorp
- ○ Platteland

Q8 Wat is uw huidige werksituatie? (meerdere antwoorden mogelijk)

- ☐ Werkend in loondienst, … uur per week _____
- ☐ Zelfstandige/ZZP'er), … uur per week _____
- ☐ Vrijwilligerswerk, … uur per week _____
- ☐ Geen betaalde baan
- ☐ Student
- ☐ Anders _____

Q9 Wat was uw gezondheidssituatie afgelopen week?

- ○ Gezond
- ○ Problemen door Covid-19 (symptomen: verkouden, hoesten, koorts of kortademig)
- ○ Anders, namelijk … _____

Q11 In hoeverre bent u afgelopen week buiten uw huis geweest? (meerdere opties mogelijk)

- ☐ Ik ben niet buiten geweest
- ☐ Alleen naar buiten op eigen terrein (balkon, tuin)
- ☐ Alleen naar buiten voor noodzakelijke boodschappen, de hond uitlaten, een frisse neus halen of iets voor een ander doen.
- ☐ Naar buiten om naar mijn werk te gaan
- ☐ Naar buiten voor wandeling/sporten

End of Block: Demografie

Start of Block: INTERNATIONALE LICHAMELIJKE ACTIVITEITEN VRAGENLIJST - KORTE VERSIE

Q27 Wij zijn geïnteresseerd welke vorm(en) van lichamelijke activiteit mensen verrichten in hun dagelijkse leven. De vragen gaan over uw lichamelijke activiteit gedurende de afgelopen 7 dagen. Beantwoordt u alstublieft alle vragen, ook al beschouwt als u uzelf als niet lichamelijk actief. Denkt u aan activiteiten die u doet op het werk (mits u nog mag werken), in en rond het huis, om van de ene naar de andere plaats te komen en activiteiten in uw vrije tijd voor recreatie of sport.

End of Block: INTERNATIONALE LICHAMELIJKE ACTIVITEITEN VRAGENLIJST - KORTE VERSIE

Start of Block: INTERNATIONALE LICHAMELIJKE ACTIVITEITEN VRAGENLIJST - KORTE VERSIE - Zwaar

Q13 Denkt u aan alle zware lichamelijke activiteiten die u deed in **de afgelopen 7 dagen**. **Zware** lichamelijke activiteiten zijn activiteiten die veel lichamelijke inspanning kosten en voor een veel snellere ademhaling zorgen. Denk *alleen* aan de activiteiten die u ten minste

10 minuten per keer heeft verricht.
Als u denkt aan **de afgelopen 7 dagen**, op hoeveel van deze dagen heeft u **zware** lichamelijke activiteiten verricht zoals zware lasten tillen, spitten, aerobics of wielrennen?

○ Dagen _____

○ Geen zware lichamelijke activiteiten verricht

Skip To: End of Block If Q13 = Geen zware lichamelijke activiteiten verricht

Q14 Op de dagen dat u zwaar lichamelijk actief was, hoeveel tijd heeft u daar dan gewoonlijk aan besteed?

☐ Uren per dag _____

☐ Minuten per dag _____

☐ Weet niet / niet zeker

End of Block: INTERNATIONALE LICHAMELIJKE ACTIVITEITEN VRAGENLIJST - KORTE VERSIE - Zwaar

Start of Block: INTERNATIONALE LICHAMELIJKE ACTIVITEITEN VRAGENLIJST - KORTE VERSIE - Matig

Q15 Denkt u aan activiteiten die **matige** lichamelijke inspanning kosten en die u in **de afgelopen 7 dagen** heeft verricht. **Matig** intensieve lichamelijke activiteit laat u iets sneller ademen dan normaal. Denkt u weer alleen aan activiteiten die u ten minste 10 minuten per keer heeft verricht. Als u denkt aan **de afgelopen 7 dagen**, op hoeveel van deze dagen heeft u **matig** intensieve lichamelijke activiteit verricht, zoals het dragen van lichte lasten, fietsen in een normaal tempo of dubbeltennis? Laat wandelen hier buiten beschouwing.

○ Dagen _____

○ Geen matige lichamelijke activiteiten verricht

Skip To: End of Block If Q15 = Geen matige lichamelijke activiteiten verricht

Q16 Op de dagen dat u **matig** intensief lichamelijk actief was, hoeveel tijd heeft u daar dan gewoonlijk aan besteed?

- ☐ Uren per dag _____
- ☐ Minuten per dag _____
- ☐ Weet niet / niet zeker

End of Block: INTERNATIONALE LICHAMELIJKE ACTIVITEITEN VRAGENLIJST - KORTE VERSIE - Matig

Start of Block: INTERNATIONALE LICHAMELIJKE ACTIVITEITEN VRAGENLIJST - KORTE VERSIE - Wandelen

Q17 Als u denkt aan **de afgelopen 7 dagen**, op hoeveel dagen heeft u tenminste 10 minuten per keer **gewandeld**? Denk hierbij aan wandelen op het werk en thuis, wandelen om van de ene naar de andere plaats te komen, en al het andere wandelen dat u deed tijdens recreatie, sport of vrijetijdsbesteding.

- ○ dagen per week _____
- ○ Geen dag gewandeld

Skip To: End of Block If Q17 = Geen dag gewandeld

Q18 Op de dagen dat u ten minste 10 minuten per keer **wandelde**, hoeveel tijd heeft u daar dan gewoonlijk aan besteed?

- ○ Uren per dag _____
- ○ Minuten per dag _____
- ○ Weet niet / niet zeker

End of Block: INTERNATIONALE LICHAMELIJKE ACTIVITEITEN VRAGENLIJST - KORTE VERSIE - Wandelen

Start of Block: INTERNATIONALE LICHAMELIJKE ACTIVITEITEN VRAGENLIJST - KORTE VERSIE - Overig

Q19 Hoeveel tijd bracht u gewoonlijk **zittend** door gedurende een **doordeweekse** dag **in de afgelopen 7 dagen**? Bij deze tijd mag zitten achter een bureau, tijd die zittend wordt doorgebracht met vrienden, zittend lezen, studeren of tv kijken worden gerekend.

- ○ Uren per dag _____
- ○ Minuten per dag _____
- ○ Weet niet / niet zeker

Q20 Welke sportieve activiteiten heeft u afgelopen weken verricht? Noteer alleen de activiteiten die je voor meer dan 10 minuten doet. (Meerdere antwoorden mogelijk)

- ☐ Hardlopen
- ☐ Wandelen
- ☐ Skaten
- ☐ Wielrennen, MTB
- ☐ Cardio binnen
- ☐ Krachttraining binnen
- ☐ Anders, namelijk ..

_____

- ☐ Ik sport niet

Q21 Welke sport beoefende u voordat de Covid-19 isolatie maatregelen waren begonnen? (meerdere antwoorden mogelijk)

- ☐ Wandelen … minuten/week _____
- ☐ Hardlopen … minuten/week _____
- ☐ Skaten / schaatsen … min/week _____
- ☐ Wielrennen, MTB ... min/week _____
- ☐ Fitness/cardio binnen ... min/week _____
- ☐ Krachttraining binnen ... min/week _____
- ☐ Contact sport buiten (voetbal, hockey etc.) ... min/week _____
- ☐ Contact sport binnen (zaalvoetbal, volleybal, etc) ... min/week _____
- ☐ Anders, namelijk .. ... min/week _____
- ☐ Ik sport niet

Skip To: End of Block If Q21 = Ik sport niet

Q22 In hoeverre hebben de Covid-19 social-distancing maatregelen ervoor gezorgd dat u bent belemmerd in het uitoefenen van deze sport?

Helemaal niet	Niet	Neutraal	Wel	Heel erg wel
0	1	2	3	4	5

Belemmerd in uitoefenen sport	

End of Block: INTERNATIONALE LICHAMELIJKE ACTIVITEITEN VRAGENLIJST - KORTE VERSIE - Overig

Start of Block: Intentions

Q23 De volgende uitspraken hebben betrekking op uw intentie om in de toekomst dagelijks 30 minuten lichamelijk actief te zijn. Zet een kruisje bij het antwoord dat het best op u van toepassing is.

	Helemaal oneens	Oneens	noch mee eens/noch mee oneens	Eens	Helemaal eens
Ik ben van plan om in de komende 7 dagen dagelijks 30 minuten aan matige lichamelijke activiteit te doen, zoals wandelen, fietsen, of tuinieren.	○	○	○	○	○
Ik ben van plan om in de komende 7 dagen dagelijks 30 minuten aan zware lichamelijke activiteit te doen, zoals hardlopen, wielrennen of skaten.	○	○	○	○	○
Ik ben van plan om in de komende 30 dagen dagelijks 30 minuten aan matige lichamelijke activiteit te doen, zoals fietsen, wandelen, of tuinieren.	○	○	○	○	○
Ik ben van plan om in de komende 30 dagen dagelijks 30 minuten aan zware lichamelijke activiteit te doen, zoals hardlopen, wielrennen of skaten.	○	○	○	○	○

Q30 **Zelf-effectiviteit**

Het advies van de Gezondheidsraad is: Doe minstens 150 minuten per week aan matig intensieve inspanning, zoals wandelen en fietsen, verspreid over diverse dagen. Langer, vaker en/of intensiever bewegen geeft extra gezondheidsvoordeel. Doe minstens tweemaal per week spier- en botversterkende activiteiten, voor ouderen gecombineerd met

balansoefeningen. En: voorkom veel stilzitten

De volgende uitspraken schetsen situaties die vaak genoemd worden als redenen om niet lichamelijk actief te zijn. Geef voor de onderstaande uitspraken aan in welke mate u overtuigd bent om toch in staat te zijn aan lichamelijke beweging te doen, zoals fietsen, wandelen, huishouden en tuineren.

Q31 Ik voel mij in staat wekelijks mij aan deze bovenstaande richtlijnen te houden, ondanks ...

	Helemaal oneens	Oneens	Noch mee eens, noch mee oneens	Eens	Helemaal eens
Ondanks dat het weer heel slecht is (te warm, broeierig, nat, koud)	○	○	○	○	○
Ondanks dat de activiteit me verveelt.	○	○	○	○	○
Ondanks dat ik geen interesse heb in de activiteit	○	○	○	○	○
Ondanks dat ik pijn heb, of mij niet lekker voel tijdens de inspanning	○	○	○	○	○
Ondanks dat ik de activiteit alleen moet uitvoeren.	○	○	○	○	○
Ondanks dat het niet leuk of plezierig is.	○	○	○	○	○
Ondanks dat ik veel persoonlijke stress te verduren heb.	○	○	○	○	○

End of Block: Intentions

Start of Block: Persoonlijkheid

Q25 Hieronder staan een aantal eigenschappen die wel of niet op u van toepassing zijn. We verzoeken u om voor elk paar eigenschappen aan te geven in hoeverre het paar eigenschappen u beschrijft. Het is de bedoeling dat u aangeeft hoe goed elk paar

eigenschappen op u van toepassing is, ook als de ene eigenschap misschien meer van toepassing is dan de andere.

	1 - Beschrijft mij helemaal niet goed	2	3	4	5	6	7- Beschrijft mij zeer goed
extravert, enthousiast	○	○	○	○	○	○	○
kritisch, ruziezoekend	○	○	○	○	○	○	○
grondig, gedisciplineerd	○	○	○	○	○	○	○
angstig, makkelijk van streek te brengen	○	○	○	○	○	○	○
open voor nieuwe ervaringen, levendige fantasie	○	○	○	○	○	○	○
gereserveerd, stil	○	○	○	○	○	○	○
sympathiek, vriendelijk	○	○	○	○	○	○	○
lui, gemakzuchtig	○	○	○	○	○	○	○
kalm, emotioneel stabiel	○	○	○	○	○	○	○
weinig artistieke interesse, weinig creatief	○	○	○	○	○	○	○

End of Block: Persoonlijkheid

Start of Block: Waargenomen kwetsbaarheid

Q27 *Onderstaande stellingen gaan over hoe kwetsbaar u zich voelt voor ziektes. Geef voor de volgende stellingen aan in hoeverre u het eens bent met de stelling. Klik op het antwoord van uw keuze*

	1. Sterk mee oneens	2. Erg oneens	3. Beetje oneens	4. Noch mee oneens/noch mee eens	5. Beetje eens	6. Erg eens	7. Sterk mee eens
1. Het stoort me wanneer mensen niezen zonder hun mond te bedekken.	○	○	○	○	○	○	○
2. Als een ziekte heerst, krijg ik het ook.	○	○	○	○	○	○	○
3. Ik vind het prima om een waterflesje te delen met een vriend(in).	○	○	○	○	○	○	○
4. Ik houd er niet van om met een potlood te schrijven waar iemand anders op heeft gekauwd.	○	○	○	○	○	○	○
5. Uit ervaring weet ik dat ik niet snel ziek word, zelfs als mijn vrienden ziek zijn.	○	○	○	○	○	○	○
6. Ik ben altijd vatbaar geweest voor infectieziekten.	○	○	○	○	○	○	○
7. Na het schudden van iemands hand, was ik graag mijn handen.	○	○	○	○	○	○	○
8. Over het algemeen ben ik erg vatbaar voor verkoudheden, griep, en andere infectieziekten.	○	○	○	○	○	○	○
9. Ik houd er niet van om tweedehands kleding te dragen, omdat je niet weet wie het daarvoor droeg.	○	○	○	○	○	○	○

10. Ik heb meer kans dat ik een infectieziekte oploop, dan de mensen om mij heen.	○	○	○	○	○	○	○
11. Mijn handen voelen niet vies na het aanraken van geld.	○	○	○	○	○	○	○
12. Het is onwaarschijnlijk dat ik een verkoudheid, griep, of andere ziekte krijg, zelfs als het heerst.	○	○	○	○	○	○	○
13. Het maakt me niet angstig wanneer ik me tussen zieke mensen begeef.	○	○	○	○	○	○	○
14. Mijn immuunsysteem beschermt me tegen de meeste ziekten die andere mensen krijgen.	○	○	○	○	○	○	○
15. Ik vermijd het gebruik van andermans telefoon of tablet, omdat ik iets zou kunnen oplopen van de vorige gebruiker.	○	○	○	○	○	○	○

Q29 In hoeverre bent u bang om naar buiten te gaan tijdens deze quarantaine door Covid-19?

	Helemaal niet	Nauwelijks	Soms	Vaak	Altijd
In hoeverre bent u bang om naar buiten te gaan tijdens deze quarantaine door Covid-19?	○	○	○	○	○

End of Block: Waargenomen kwetsbaarheid