The Effects of Implementation Intentions, Public Commitment, and Self-Persuasion on Self-Reported Physical Activity

C. J. Gerritsma

Radboud University Nijmegen

Master Thesis Behavioural Science

Course: Internship and Thesis SOW-PSMBC75-2019

Supervisor: T. Verwijmeren

Company: De Beweegreden

External Supervisor: J. Buivenga

Student number: S4493060

Date: 3 July 2020

Word count: 6808

Abstract

While it is one of the best preventive healthcare practices, individuals engage too little in physical activity. Physical activity is related to a longer life span, can delay the onset of chronic conditions and has positive financial consequences. This research examined the effect of an intervention combining several behaviour change techniques: implementation intentions, public commitment, and self-persuasion, on self-reported physical activity. The sample (N=14, M_{age}=27.64 years, SD=5.11) took part in a short-term longitudinal study with a three-wave mixed design. Their physical activity level was assessed with the International Physical Activity Questionnaire. A Repeated Measures ANOVA was conducted and indicated no significant changes in the level of physical activity between the pre-measure, post-measure, and follow-up in the different conditions. By conducting an exploratory analysis, it appeared that self-persuasion as well as providing ten pro physical activity arguments could increase physical activity intention more than their level of physical activity in the past seven days. These results have important implications for behavioural change in the area of physical activity.

Word count: 167 words

Keywords: physical activity, implementation intentions, public commitment, self-persuasion

Human beings are greatly inconsistent in performing health behaviours. On average, only 50% of those who enrol in fitness programs are still exercising after six months (Dishman, 1991). A fitness club in The Netherlands called *De Beweegreden*, which the first author is familiar with, indicated that 59% never came to a training although they indicated that they would. This inconsistency leads to a lack of physical activity. This can either be leisure time activity, or not taking active transportation to work such as bicycling or walking (Blackwell & Clarke, 2018; Hansen, Kolle, Dyrstad, Holme, & Anderssen, 2012; Matthews et al., 2008; World Health Organization, 2003). The trend that is illustrated by *De Beweegreden* is also visible on a national level. While the World Health Organization (WHO) advises at least 150 minutes of moderate physical activity throughout the week for adults aged 18 to 64 years old (World Health Organization, 2010), this minimum is not met by around 50% of the adults in the Netherlands (World Health Organization, 2016). It might, therefore, be fruitful to look into interventions that can increase this percentage.

There are several consequences related to physical activity. Physical activity is related to a longer life span and it can delay the onset of 40 chronic conditions (Ruegesegger & Booth, 2018). There is clear cut evidence that demonstrates the relationship between physical activity and a 20 to 30% risk reduction of premature mortality and a reduced risk of chronic diseases (Paterson & Warburton, 2010; Warburton, Charlesworth, Ivey, Nettlefold, & Bredin, 2010). Furthermore, 2 out of 5 deaths worldwide and 30% of the global disease burden are related to low physical activity (Candari, Cylus, & Nolte, 2017). Besides the medical consequences, there are financial consequences of insufficient physical activity. In the Netherlands, the medical costs of physical inactivity account for roughly 2% of the total medical care costs. This leads to an amount of 1.3 billion euros (Polder, Hoogenveen, Luijben, Van den Berg, Boshuizen, & Slobbe, 2012). Furthermore, there is a 2.000 USD difference in medical costs per person between individuals who are active 4 times a week and individuals who are not active at all (Wang, McDonald, Reffitt, & Edington, 2015), these lower medical care costs are irrespective of physical performance (Yang et al., 2011). Physical activity thus has positive effects on the health of an individual as well as financial benefits.

Although being sufficiently physically active has positive health and financial consequences, individuals do not meet the guidelines set by the WHO. Furthermore, individuals who have proper motivation still fail to translate this motivation into action (e.g. Dishman, 1991). This problem is referred to as an intention-behaviour gap. The intention-behaviour gap is a phenomenon that can explain inactivity in individuals. The theory is that individuals do have the motivation or the intention to change their behaviour, but in the end do not act on these intentions and do not display the behaviour (Sheeran & Webb, 2016). In a meta-analysis, it appeared that only 54% of intenders of physical activity would translate their intention into behaviour (Rhodes & de Bruijn, 2013). How well an intention is translated to actual behaviour depends mainly on the strength of the intention (Sheeran & Webb, 2016). In addition to this, the Theory of Planned Behaviour states that having an intention is a necessary component to display behaviour (Ajzen, 2011). The strength of a behavioural intention determines how well it is translated into behaviour (Webb & Sheeran, 2006). Thus, before overcoming the intention-behaviour gap the strength of the intention must be adequate.

One way of strengthening the intention is by increasing attitude strength (Ajzen, 2011). Attitudes are a rather complex construct and deserve some explanation. Eagly and Chaiken (1993) have formulated it as a psychological tendency that is expressed by evaluating a particular entity with some degree of favour or disfavour. An attitude can be personally important, which leads people to use their attitudes for decision making (Boninger, Krosnick, & Berent, 1995). An attitude is furthermore relatively stable over time (Buhrmester, Blanton, & Swann Jr, 2011) and therefore robust to changes. Furthermore, when an attitude becomes stronger, it is more stable and more predictive of intentions (Holland, Verplanken, & Van Knippenberg, 2002). Therefore, if someone has a strong positive attitude towards physical activity, they are more likely to have a higher intention to be physically active.

After having a strong intention, it is important to translate this intention into behaviour. Several psychological phenomena are predictive of behaviour. First, habits can predict behaviour. Habits are behaviours that are repeated regularly, and will, therefore, become subconscious over time (Andrews, 1903). When behaviour is habitual, behavioural responses will be automatically activated (Aarts & Dijksterhuis, 2000). New behaviours can become automatic through the process of regular repetition (Lally, van Jaarsveld, Potts, & Wardle, 2010), and therefore stable over time. For example, if an individual walks every morning, this physical activity behaviour is likely to become a habit.

A second psychological phenomenon that can explain physical activity is self-efficacy. Self-efficacy states that if an individual believes he or she can fulfil a certain task, he or she is more likely to succeed. Furthermore, the theory postulates that an individual is more likely to overcome obstacles that would normally interfere with achieving the desired goal (Bandura, 2010). Thus, if an individual has a high self-efficacy, he or she is likely to view him- or herself as more competent. This more competent view of oneself results in a more positive self-appraisal of capabilities (Bandura, 1989). Individuals with high self-efficacy, are more likely to complete a task and are willing to put more effort into it (Schunk, 1990). Furthermore, individuals with a high self-efficacy, and therefore a positive self-appraisal, are better able to maintain physical activity tasks over a longer period (McAuley, Jerome, Elavsky, Marquez, & Ramsey, 2003). Therefore, if an individual feels competent in completing a physical activity task (for example, walking for half an hour) and thus has a positive self-appraisal, he or she will more likely complete that task.

Thus, before actual physical activity behaviour is shown, an individual must have a strong intention to be more physically active. After having a strong intention, this intention must be translated into actual behaviour. This means that intention strength is necessary as a first step. When this is intention is at an adequate level, it is important to bridge the intention-behaviour gap as described earlier. This can be done with the help of habit formation and positive self-appraisal. The intention to be more physically active is often present in individuals who are motivated to be more physically active, but the intention is not being translated into actual behaviour (Arnautovska, Fleig, O'Callaghan, & Hamilton, 2017: Arnautovska, Fleig, O'Callaghan, & Hamilton, 2019; Jackson, Smith, & Conner, 2003). A few techniques will be described how to alter the intention strength and how to overcome the intention-behaviour gap, these techniques will focus on a direct behavioural effect as well as a more sustainable, longer-lasting, effect.

First, it is important to make sure that the intention of the individual is strong enough to be motivated to translate intention to physical activity behaviour. An excellent means of strengthening an intention is self-persuasion. Self-persuasion postulates that an individual persuades itself to change its behaviour. An individual should formulate arguments about why it is good to act in a certain way. The individual may conclude that this is his or her stance and therefore the individual believes the change comes from within instead of an external source (Aronson, 1999), and thus is far more likely to change their intention than other-generated persuasion (Millon, Lerner, & Weiner, 2003). If an individual engages in self-persuasion, it will form stronger behavioural intentions (Müller, van Someren, Gloudemans, Van Leeuwen, & Greifeneder, 2017).

Furthermore, an attitude change is likely in individuals employing self-persuasion. It is argued that an attitude is formed by observing your behaviour (Bem, 1967). With self-persuasion, an individual formulates arguments about why it is preferable to act in a certain way. The individual may conclude that the formulated arguments are part of his or her attitude (Müller et al., 2017). Results indicated that strong attitudes could predict physical activity intentions (Hagger, Chatzisarantis, & Biddle, 2001). Since an attitude tends to be robust over time (Buhrmester et al., 2011), it can be argued that self-persuasion can bring about long-lasting changes in intention strength and eventually change physical activity behaviour.

Once this intention is positively strengthened, the intention-behaviour gap should be bridged. An excellent means of targeting this are implementation intentions. Implementation intentions are if-then plans: ‘if’ is being followed by an environmental cue and ‘then’ is being followed by a goal-directed response (Prestwich, Sheeran, Webb, & Gollwitzer, 2015). It specifies the response one will perform to achieve his or her goal in a given situation. This technique aids in goal attainment since a goal-directed behaviour is specified in a particular event or cue (Gollwitzer & Brandstaetter, 1997). Eventually, after regular repetition, that behaviour will become automatic and habitual (Brickell, Chatzisarantis, & Pretty, 2006). Results show that physical activity intentions are far more likely to be translated into behaviour when individuals experience their behaviour as habitual (de Bruijn, 2011; Rhodes, de Bruijn, & Matheson, 2010). Habits are also strong predictors of behaviour over a longer period, and habitual behaviour will be spontaneously triggered upon encountering the environmental cue (Gardner & Rebar, 2019). A meta-analysis reviewed the effects of an implementation intention intervention on physical activity. Results showed that implementation intentions had a moderately significant effect on physical activity maintenance over a longer period (Bélanger-Gravel, Godin, & Amireault, 2013). Having individuals create a habitual routine where an environmental cue follows a goal-directed response, aids in overcoming the intention-behaviour gap as well as physical activity in the long term.

Another technique that helps to bridge the intention-behaviour gap is public commitment. If an individual makes its intention public or known to others, it will more likely translate intentions into behaviour (Staats, Harland, & Wilke, 2004). These effects find its origin in multiple other principles. First, if an individual states his or her goals publicly, it will have a higher self-presentation and self-appraisal (Schienker, Dlugolecki, & Doherty, 1994). This increased self-appraisal, in turn, leads to higher feelings of competence and thus increased self-efficacy. Self-efficacy is a strong predictor of physical activity (Warner, Schüz, Wolff, Parschau, Wurm, & Schwarzer, 2014). Second, individuals have a need to be consistent. If an individual publicly commits to something, it has the urge to be consistent and show the behaviour he or she said was going to do (Guadagno & Cialdini, 2010). The third principle is accountability. If an individual publicly states his or her goals, it can be held accountable by the audience and will, therefore, have the feeling of acting on his or her statements (Abrahamse, Steg, Vlek, & Rothengatter, 2005). Results indicate that a public commitment can help overcome the intention-behaviour gap in the domain of physical activity (Forster, Zaval, Jachimowicz, Berry, & Weber, 2020; Munson, Krupka, Richardson, & Resnick, 2015). In addition, by committing to a cause publicly, individuals have more confidence in their attitudes. This increased confidence, in turn, increases attitude strength (Pauling & Lana, 1969). In health-behaviour research, it was found that a public commitment had a favourable impact on long-term weight loss compliance (Nyer & Dellande, 2010). Therefore, it can be believed that public commitment can bridge the intention-behaviour gap and bring about changes in the long run for physical activity.

The current study aims to increase intention strength and tackle the intention-behaviour gap and therefore increase physical activity among those that are motivated to be more physically active. The aim is a practical intervention that uses multiple factors to yield a greater effect, also known as a cocktail intervention (Hoyert, Ballard, & O'Dell, 2019). Implementation intentions, public commitment, and self-persuasion will be used in this study to yield substantial behaviour change. Each of these techniques has demonstrated to provide robust improvements in physical activity (e.g. de Bruijn, 2011; Forster et al., 2020; Warner et al., 2014) but have not been investigated in one intervention altogether. After analysis of the current study, a second exploratory study was conducted to test the effects of self-persuasion on behavioural intention regarding physical activity in isolation. It aimed to see if individuals who were exposed to self-persuasion would have a higher intention to be physically active than their current level of physical activity. It was expected that self-persuasion would increase their intention to be physically active more than their level of physical activity in the past seven days.

Study 1

The goal of the first study is to apply the knowledge that is currently known and transfer it into a field study and report the effects. The field study is conducted for a fitness club, called *De Beweegreden*, which is based in The Netherlands. This study aims to find out if and whether an intervention in which implementation intentions, public commitment, and self-persuasion are combined is effective in enhancing physical activity. Furthermore, it aims to find out if an increase in physical activity can be maintained over a longer period. The individuals who are targeted are motivated to be more physically active but fail to bridge the intention-behaviour gap regarding physical activity. Furthermore, this study aims to foster sustainable behaviour change in individuals to be more physically active in the long run.

With these goals in mind, members of the fitness club, who were motivated to be more physically active, were asked to cooperate with this study. They had to engage in self-persuasion and were asked to formulate implementation intentions. Lastly, they were exposed to a form of public commitment. This study had two main hypotheses. First, it predicted that this intervention can aid individuals in bridging the intention-behaviour gap for physical activity, and thus will be more physically active than those in the control condition. Second, it is hypothesized that individuals who are exposed to this intervention will be more physically active in the follow-up three weeks later.

Method

Participants and Design

This short-term longitudinal study had a three-wave mixed design with two conditions (experimental/control). This study aimed at achieving an alpha level of .05, with detecting a medium effect size and achieving a power of .80 (see Cohen, 1992). By conducting a power analysis, it appeared that forty-four participants were needed to achieve said power (Faul, Erdfelder, Buchner, & Lang, 2009). Sixteen people participated in the first wave of the study. Two of them were excluded in the analyses since they did not provide a mail address or telephone number to contact them for the post measure or follow up. The remaining amount of participants was fourteen, of which ten were female (71.4%) and four were male (28.6%). The age of the final sample ranged from 23 to 40 years old (M_{age}=27.64 years, SD=5.11). Participants were members of the fitness club where this study was conducted. The intervention condition consisted of six participants (42.9%), the control condition consisted of eight participants (57.1%).

Materials

This study used a combination of several techniques and a behavioural measure. These techniques were conducted via a computer task and were made with Qualtrics (Qualtrics, 2013). The study was initially constructed to take place in a real-life setting, but due to the COVID-19 pandemic, this study was forced to be taken online.

Behavioural Measure of Physical Activity. To measure the level of physical activity, the International Physical Activity Questionnaire (IPAQ) was presented. This questionnaire is a self-administered method to assess physical activity (Craig et al., 2003). It is an internationally used questionnaire that has received many reliability, and validity tests (Hallal & Victora, 2004; Lee, Macfarlane, Lam, & Stewart, 2011). Reported reliability is very good (r_s = 0.8) and criterion validity (r_s = 0.3) is comparable to most other self-report physical activity questionnaires (see Sallis & Saelens, 2000). The IPAQ is translated to Dutch to suit the participants of this study, the Dutch version had comparable reliability and validity to the international version (Vandelanotte, De Bourdeaudhuij, Philippaerts, Sjöström, & Sallis, 2005). There are two versions of the IPAQ, a short (7 questions) and a long version (31 questions). Both formats produce comparable results ($r_s = 0.67$) (Hallal & Victora, 2004), therefore, this study opted for the short version. The short IPAQ consists of seven questions. These questions examined the amount of vigorous- and moderate-activity as well as the time spent walking and time spent sedentary in the past seven days (see Appendix A).

Implementation Intentions. The formation of implementation intentions consisted of a series of five questions and was based on previous procedures (Hall, Zehr, Ng, & Zanna, 2012). The first part of these questions required participants to think about their goals ("What is your short-term goal regarding physical activity?"). The second part required participants to think about possible obstacles ("What are possible obstacles that might get in the way of achieving your goal?" and "How do you plan to overcome these obstacles?"). The third part required participants to think about environmental cues ("Where and when are you intending to achieve these goals?"). The final part gave a summary of their answers and participants were instructed to form an implementation intention that could be achieved within the next seven days. The implementation intention should look like "If I encounter situation X, then I will show behaviour Y." After the participants formed an implementation intention, they were instructed to copy their response on a paper and place it somewhere where they would be if they encountered situation X.

In the control condition, participants were instructed to form goal intentions. This is widely approved as a control condition for implementation intentions (Webb & Sheeran, 2008). The formation of goal intentions consisted of two questions. The first question focused on the goal ("What is your goal regarding physical activity?"). The second question focussed on the attainment of the goal ("How do you plan on achieving this goal?"). Participants were instructed to copy their response on a piece of paper.

Public Commitment. Public commitment was achieved by creating a group chat containing the participants in the intervention condition. In this group chat participants were instructed to share their implementation intentions. In the control condition, participants did not have such a group chat and thus no public commitment to their goals.

Self-Persuasion. Self-persuasion was achieved via two questions. Participants were instructed to write down two reasons why being physically active was valuable to them. It was made clear that the reason needed to have a personal appeal and not something that was expected by society. According to Müller and colleagues (2017), it appeared that generating two arguments was most effective in changing behaviour. The control condition was presented ten arguments about why physical activity is valuable. These arguments ranged from health perspectives to mental perspectives. Ten arguments were given since it appeared to be less effective in contrast to generating two arguments (Müller et al., 2017). Although providing ten arguments still yielded some effect in Müller et al. (2017), this study opted to use this technique nonetheless to make sure the individuals in the control condition were not aware of being in that particular condition to prevent threats to the internal validity.

Procedure

This study was preregistered via *aspredicted.org* and can be found on https://aspredicted.org/993uu.pdf. Participants were recruited through social media. The fitness club has a Facebook group with its member base and it has a WhatsApp group with active members. The link to the survey was shared on both these platforms. Participants were invited to participate in a process where they would learn how to be more physically active. Only individuals who were motivated to be more physically active could participate in the study, this was done to guarantee that individuals had a certain intention to be physically active. If participants had the motivation to be more physically active and were willing to partake in this study, they could click on the link to the survey that was provided.

First, participants were informed about the goal of the study and had to sign informed consent. Next, the level of physical activity in the past seven days was assessed. After this assessment, they were randomly presented either the intervention techniques or the control techniques as described earlier. After the techniques, participants were asked for their demographics and were reminded of the post measure and follow-up. The post measure (T2) was mailed one week after completing the first part (T1) of the intervention. The follow-up (T3) was mailed two weeks after completing the post measure (T2). The post measure and follow-up consisted of an assessment of their physical activity in the past seven days, using the IPAQ. After completing the follow-up, they were thanked for their participation and were offered the opportunity to send an e-mail to the researcher to know more about the study.

Data-analysis

The sum scores of self-reported physical activity were calculated as intended by the IPAQ Research Committee (2005). Participants were asked to rate their physical activities on three levels in the past seven days. They needed to indicate how many minutes per week they were either walking, moderately active, or vigorously active. Moderate activity, for example, consisted of riding a bicycle or tennis doubles. Vigorous activity, for example, could consist of rope jumping or playing a basketball game. The IPAQ research committee proposed it to be expressed as MET (Metabolic Equivalent of Task) per minutes. The sum score was calculated as MET-min per week: MET level x minutes of activity x events per week. MET level for vigorous activity was classified as 8, for moderate activity as 4, and for walking as 3.3 (see for an extensive description: Ainsworth et al., 1993). This gave a total score of physical activity for T1, T2 and T3 per participant.

Results

First of all, sample descriptives of all variables were computed to obtain a first impression of the data. These include the mean and standard deviation per variable and condition (see Table 1).

Table 1

Sample descriptives for all variables

	Intervention condition (*n*=6)		Control condition (*n*=8)	
	M	*SD*	*M*	*SD*
Physical activity pre-measure	2297.42	769.83	3282.75	666.69
Physical activity level post-measure	1589.67	1003.66	3557.81	869.20
Physical activity level follow-up	2160.92	614.70	3029.63	532.35

Note. M = Mean. *SD* = Standard Deviation. The intervention condition was exposed to implementation intentions, public commitment, and self-persuasion. The control condition was exposed to goal intentions and provided arguments. The level of physical activity was measured using the IPAQ.

To test the hypotheses if the intervention could increase physical activity in the short term and the long term, a Repeated Measures ANOVA was conducted using IBM SPPS Statistics 25. Assumptions were checked, sphericity was not violated $\chi^2(2) = .129$, $p = .937$. Levene’s test, however, indicated that the post measure (T2) violated the assumption of homogeneity $F(1,12) = 6.358$, $p < .05$. This violation is not considered to be a threat to the test since the ANOVA is generally considered to be robust to violations when groups are roughly equal (Keppel, Saufley, & Tokunaga, 1992). The multivariate tests indicated no interaction effect of time and condition on the self-reported physical activity $F(2,11) = .743$, $p = .498$. Furthermore, there was no main effect of time on self-reported physical activity $F(2,11) = .121$, $p = .887$. The test of between-subject effects indicated no significant main effect of condition on self-reported physical activity $F(1,12) = 1.929$, $p = .190$. This suggests that both groups did not differ in self-reported physical activity directly after the intervention, as well as three weeks later.

Discussion

The aim of study 1 was to investigate the effects of an intervention which combined implementation intentions, public commitment, and self-persuasion. It was expected that this intervention would increase self-reported physical activity shortly after the intervention. It furthermore expected that these results would be persistent over a period of three weeks. The results found in this study are not able to confirm these hypotheses. An intervention that uses the three techniques was not able to increases physical activity. This is persistent directly after the intervention, as well as three weeks after the intervention.

The results found in this study are not in accordance with previously found literature. All three facets of the intervention used in this study were previously proven to be effective in the short term (e.g. de Bruijn, 2011; Forster et al., 2020; Warner et al., 2014), and in the long term (e.g. Bélanger-Gravel et al., 2013; Müller et al., 2017; Nyer & Dellande, 2010). Therefore, study limitations deserve some consideration to explain the current results.

The first and most pronounced study limitation is the sample size. This study aimed at recruiting forty-four participants. In the final sample, fourteen individuals participated in this study, six of this sample were in the intervention condition. This resulted in a highly underpowered study, which increased the chance of a Type II error (Myors, 2006). With a Type II error, there might be an effect in the population, but this effect is not present in the sample. This means that a null hypothesis is rejected falsely. In this case, this could mean that the intervention used in this study increases physical activity, although not found in this sample. Thus, a true effect of the intervention might be present, but because of a small sample size, and therefore low power, this effect is not found in this sample.

A second study limitation that deserves consideration is circumstances beyond the researcher’s control. Because of the COVID-19 pandemic that took place worldwide, and likewise in the Netherlands, this study was forced to be taken online. Most studies using implementation intentions and public commitment are conducted in a face-to-face setup. Meaning that the researcher can help construct good implementation intentions and that a public commitment is made to a greater audience. In the current study design, individuals were instructed to construct implementation intentions by themselves. The participants did not receive any aid in constructing these implementation intentions since they were constructed in an online environment. After inspecting the implementation intentions, it appeared that most of the implementation intentions lacked an environmental cue. An environmental cue is a necessary component for implementation intentions to work (Prestwich et al., 2015). Without an environmental cue, no automatization of behaviour will occur (Gollwitzer, 1999). Proper implementation intentions are necessary for behaviour change to happen (de Vet, Oenema, & Brug, 2011).

Furthermore, public commitment could be of lower impact than originally planned. Since six individuals were in the intervention condition, there were not many individuals to whom the commitment was made. The group chat consisted of only eight people, namely, six participants, a researcher, and a supervisor. Literature states that the more publicly (i.e. more people) a commitment is made, the more effect it can yield (Hollenbeck, Williams, & Klein, 1989; Nyer & Dellande, 2010). Therefore, the individual might have had a lower feeling of accountability (Abrahamse et al., 2005), and could the desired effect not be achieved.

As this study used a cocktail intervention to increase intention and bridge the intention-behaviour gap, we are not sure whether we failed to bridge the gap or if participants did not have a sufficient intention to exercise more in the first place. Therefore, a second study was conducted to test the self-persuasion manipulation on the intention to be more physically active.

Study 2

The second study aimed to, exploratively, look into the effects of self-persuasion on the intention to be more physically active. The results of study 1 unexpectedly showed no effect of the intervention on self-reported physical activity. After interpreting these results, study 2 was conducted to see if one of the active techniques on its own could influence physical activity intention. Due to time constraints, it was not possible to measure implementation intentions or public commitment. This study looked into the effects of self-persuasion in isolation. According to previously described literature about self-persuasion (e.g. Millon et al., 2003; Müller et al., 2017; Warner et al., 2014), it is hypothesized that a self-persuasion exercise can lead to more physical activity intention than providing arguments.

Methods

Participants and Design

Initially, eighty-six participants took part in this study. One individual did not report any activity at all and was therefore removed from the dataset. Three individuals had a Z-score over 3 and were considered outliers, thus removed from the dataset. Four individuals indicated to be active for less than 10 minutes, which according to the IPAQ scoring protocol is considered too low, and were removed from the dataset. The final set consisted of seventy-eight participants (47 females, M_{age}=32.2 years, SD=14.64), who were randomly assigned to either the self-persuasion or the provided arguments condition.

Procedure and Measures

Participants for this study were recruited through WhatsApp. The researcher invited acquaintances to participate in the study and they were asked to invite acquaintances of their own. First, participants were informed about the goal of the study and signed informed consent. Next, their physical activity in the last seven days was assessed. This assessment was similar as in study 1, using the Dutch short version of the IPAQ (Craig et al., 2003; Vandelanotte et al., 2005). After this assessment, they were either asked to generate two personally relevant arguments why being physically active is good for you (i.e. self-persuasion), or they would be asked to review 10 arguments why being physically active is good in general (i.e. provided arguments). This self-persuasion task was based on Müller et al. (2017). Subsequently, participants were asked for their physical activity intentions. They were asked to fill in an altered IPAQ that focussed on their intention to be physically active in the next 7 days. Sum scores of the IPAQ were calculated similarly as in study 1. Finally, they were asked for demographics and they were thanked for their cooperation.

Data Analysis

A One-way ANCOVA was conducted to determine a statistically significant difference between self-persuasion and provided arguments on the physical activity intention controlling for the level of physical activity in the past seven days. Furthermore, a paired samples t-test was conducted to compare the level of physical activity in the past seven days with the physical activity intention to detect an effect of time.

Results

First of all, sample descriptives off all variables were computed to obtain a first impression of the data. These include the mean and standard deviation per variable and condition (see Table 2).

Table 2

Sample descriptives for all variables

	Self-persuasion (n=41)		Provided arguments (n=37)	
	M	*SD*	*M*	*SD*
Current level of physical activity	2676.69	1504.63	2567.42	1869.28
Physical activity intention	3176.06	2580.08	3243.45	1745.76

Note. M = Mean. *SD* = Standard Deviation. The self-persuasion group had to generate two arguments. The provided arguments group were given ten arguments to read. The level of physical activity was measured using the IPAQ.

To test whether generating two arguments about why physical activity is good could lead to greater intentions of physical activity, a One-way ANCOVA was conducted using IBM SPSS Statistics 25. There is no significant effect of intervention type (self-persuasion vs. provided arguments) on physical activity intention after controlling for the level of physical activity in the past seven days, $F(1,75) = .182$, $p = .671$. To test an effect of time, a paired samples t-test was conducted using IBM SPSS Statistics 25. There was a significant increase in the scores for the level of physical activity in the past seven days (M=2624.86, SD=1677.12) and the physical activity intention (M=3208.03, SD=2210.00); $t(77) = -3.08$, $p = .003$. This suggests that the groups did not differ from each other in physical activity intention relative to their level of physical activity in the past seven days. However, it suggests that there is an effect of time, indicating that both groups have a higher level of physical activity intention than the level of physical activity in the past seven days.

Discussion

The aim of study 2 was to exploratively look into the effects of self-persuasion on physical activity intention. It was hypothesized that individuals who would self-persuade, would have a higher intention to be physically active than those who were presented arguments.

No support was found for this hypothesis, as the results have indicated. Furthermore, the effect of time on physical activity intention was measured. The results indicate that time had an effect on the intention of physical activity. In this study, time was a rather short period, since the pre-measure and post-measure were completed in the same questionnaire. This leads to the conclusion that individuals who were presented with a self-persuasion task, as well as individuals who were presented arguments, had the intention to be more physically active than their level of self-reported physical activity in the past seven days.

The results found in this study are not in accordance with previously found literature. There was not a difference in physical activity intention between the self-persuasion task and the provided arguments, even when such a difference initially was expected (e.g. Millon et al., 2003; Müller et al., 2017; Warner et al., 2014). However, there was an effect of time, which might indicate that both the techniques can improve physical activity intention. To further investigate these results, the effect of time will be discussed. Furthermore, it will be investigated why self-persuasion could not yield more substantial effects than providing ten arguments.

A possible explanation for these unexpected results finds itself in attitude strengths. It can be argued that the participants already had a strong positive attitude towards physical activity since they took part in a study about physical activity. A strong attitude, as described earlier, is a good predictor of physical activity intention (Hagger et al., 2001). Since the participants might already have a strong positive attitude towards physical activity, self-persuasion nor providing ten arguments could affect this intention. Given the knowledge that intentions are often higher than actual behaviour in health behaviour research (Rhodes & de Bruijn, 2013), it can be argued that, since the individuals had strong positive attitudes towards physical activity, their intention rises irrespective of the condition.

It could also be the case that both techniques increased physical activity intention more than the level of physical activity in the past seven days. It could be argued that irrespective of the condition, the participants had the intention to be more physically active. With an online intervention, as used in this study, it might be easier for a participant to indicate a higher intention, since they will not be held accountable for what they indicate during an online study. It can be argued that, when such a study takes place in a face-to-face environment, the participants might have the feeling to be held accountable by the researcher for what they indicate as their physical activity intentions. Since the researcher is not present in an online environment, it might be easier to indicate higher levels of physical activity intention irrespective of the condition.

General Discussion

Due to the COVID-19 pandemic, both studies were conducted in an online environment, this has several implications for interpreting the results. In study 1, no effect of an intervention combining implementation intentions, public commitment, and self-persuasion on self-reported physical activity have been found. There are no effects one week after the intervention as well as three weeks after the intervention. The most probable reason for this null effect is likely the small sample size. To test the effect of self-persuasion in isolation, study 2 was conducted. Self-persuasion as well as providing ten arguments were found to increase physical activity intention more than the self-reported level of physical activity in the past seven days. Since study 2 only measured intention, there is no conclusion to be drawn for actual physical activity behaviour.

An explanation for the absence of an effect of the intervention in physical activity might be that implementation intentions are not suited for an online study regarding physical activity. As described earlier, implementation intentions are concrete plans with a specified environmental cue. Often, implementation intentions are made with the help of the researcher. Due to the online environment in which this study took place, it might have been harder for the participants to come up with specific implementation intentions. After investigating the implementation intentions made by the participants, it appeared that almost all missed an environmental cue. It can be argued that physical activity is a rather complex behaviour where many obstacles must be overcome to show the behaviour. An environmental cue is then even more necessary to evoke a certain behaviour pattern since the behaviour is too complex to start automatically. Without this automatization of behaviour, it will never become habitual (Gardner & Rebar, 2019). Therefore, it can be argued that physical activity behaviour is too complex and an environmental cue is needed to evoke the behaviour. This environmental cue might be harder to achieve in an online environment.

Furthermore, it could be that public commitment was not effective enough because of the online environment. Implementation intentions were shared in a WhatsApp group in which the participants did not know each other. One of the active ingredients of a public commitment is accountability (Abrahamse et al., 2005). It can be argued that it is easier to not follow up on those commitments since the others are not personally known and therefore hold you less accountable.

Certain limitations need to be considered. As described before, this study was conducted in an online environment. Subsequently, the behavioural measurement was not in a naturalistic setting, and will, therefore, most likely differ from real physical activity behaviour. However, the behavioural measurement was a validated and reliable way of measuring physical activity and might, therefore, come close to actual behaviour. Another noteworthy point is that physical activity was self-reported. From previous research we know that self-report is prone to bias and individuals will likely overestimate their behaviour. As a result, the participants might have interpreted their physical activity behaviour more positively. However, since the pre-measure, post measure, follow-up, and intentional level of physical activity were self-reported via the same questionnaire, this poses no serious threat to interpreting the results. If a participant overestimates their initial level of physical activity, it would do so in the post-measure and follow up by the same magnitude. The same logic applies if someone underestimates their level of physical activity.

Since study 1 had a major limitation, having a small sample size, future research could try and replicate this study with a sufficient sample size of forty-four as proposed in this paper. Furthermore, physical activity could be measured in a naturalistic setting, rather than a self-report in an online environment. Also, future research may look into the effects of using less than ten arguments to look into the *more is better* argument. It can be argued that by using fewer arguments as a control condition, an effect can be better established (Müller et al., 2017). If no such effect is found, then that means there are some serious implications in the field of self-persuasion. If direct persuasion appears to work just as fine in an online environment regarding physical activity as self-persuasion, easier interventions can be developed which yield the same results. Furthermore, by investigating the effects of fewer arguments, more accurate control conditions in future studies or intervention programmes can be provided. Lastly, future research may investigate the effects of the other components used in the intervention (i.e. implementation intention and public commitment). Although these have been investigated various times in naturalistic settings, it remains unclear how these techniques work regarding the IPAQ. It would be interesting to see which of the factors used in this research have the greatest effect on self-reported physical activity. By investigating these factors individually, they can be compared and used in later studies. By gaining insight into which technique works best, substantial behaviour change can be achieved in later studies or intervention programmes.

This study extended the research into effective techniques in increasing intention and to bridge the intention-behaviour gap regarding physical activity. It aimed to do so by combining implementation intentions, public commitment, and self-persuasion into an intervention. Furthermore, it tested whether self-persuasion was an effective means of altering self-reported physical activity intention. Whereas the findings are not in line with previous research about creating interventions, which tend to produce a positive effect for all individual aspects of the intervention, some interesting findings of self-persuasion on the intention to be physically active have been found. It appeared that not only self-persuasion but also providing ten pro physical activity arguments resulted in more physical activity intention than the self-reported level of physical activity in the past seven days, this extends earlier research. Providing arguments may be as fruitful as a self-persuasion exercise. The results create a ground for future research to increase physical activity in those who are motivated to be more active. Research designs could be optimized to make use of the most fruitful intervention techniques, ultimately leading to a healthier society.

Reference list

Aarts, H., & Dijksterhuis, A. (2000). Habits as knowledge structures: Automaticity in goal-directed behavior. *Journal of Personality and Social Psychology, 78*(1), 53.

Abrahamse, W., Steg, L., Vlek, C., & Rothengatter, T. (2005). A review of intervention studies aimed at household energy conservation. *Journal of Environmental Psychology 25*, 273– 291.

Ajzen, I. (2011). The theory of planned behaviour: Reactions and reflections.

Andrews, B. R. (1903). Habit. *The American Journal of Psychology*, *14*(2), 121-149.

Arnautovska, U., Fleig, L., O'Callaghan, F., & Hamilton, K. (2017). A longitudinal investigation of older adults' physical activity: Testing an integrated dual-process model. *Psychology & Health, 32*(2), 166-185.

Arnautovska, U., Fleig, L., O'Callaghan, F., & Hamilton, K. (2019). Older adults' physical activity: The integration of autonomous motivation and theory of planned behaviour constructs. *Australian Psychologist, 54*(1), 46-54.

Aronson, E. (1999). The power of self-persuasion. *American Psychologist, 54*(11), 875–884.

Bandura, A. (1989). Regulation of cognitive processes through perceived self-efficacy. *Developmental Psychology, 25*(5), 729–735.

Bandura, A. (2010). Self-efficacy. *The Corsini Encyclopedia of Psychology*, 1-3.

Bélanger-Gravel, A., Godin, G., & Amireault, S. (2013). A meta-analytic review of the effect of implementation intentions on physical activity. *Health Psychology Review*, *7*(1), 23-54.

Bem, D. J. (1967). Self-perception: An alternative interpretation of cognitive dissonance phenomena. *Psychological Review*, *74*(3), 183.

Blackwell, D. L., & Clarke, T. C. (2018). State variation in meeting the 2008 federal guidelines for both aerobic and muscle-strengthening activities through leisure-time physical activity among adults aged 18-64: United states, 2010-2015. *National Health Statistics Reports*, (112), 1-22.

Boninger, D. S., Krosnick, J. A., & Berent, M. K. (1995). Origins of attitude importance: Self-interest, social identification, and value relevance. *Journal of Personality and Social Psychology*, *68*(1), 61.

Brickell, T. A., Chatzisarantis, N. L., & Pretty, G. M. (2006). Using past behaviour and spontaneous implementation intentions to enhance the utility of the theory of planned behaviour in predicting exercise. *British Journal of Health Psychology*, *11*(2), 249-262.

Buhrmester, M. D., Blanton, H., & Swann Jr, W. B. (2011). Implicit self-esteem: Nature, measurement, and a new way forward. *Journal of Personality and Social Psychology*, *100*(2), 365.

Candari, C. J., Cylus, J., & Nolte, E. (2017). *Assessing the economic costs of unhealthy diets and low physical activity: An evidence review and proposed framework* (Vol. 47). WHO Regional Office for Europe.

Cohen, J. (1992). Things I have learned (so far). *American Psychologist, 45,* 1304-1312.

Craig, C. L., Marshall, A. L., Sjöström, M., Bauman, A. E., Booth, M. L., Ainsworth, B. E., ... & Oja, P. (2003). International physical activity questionnaire: 12-country reliability and validity. *Medicine & Science in Sports & Exercise*, *35*(8), 1381-1395.

de Bruijn, G. J. (2011). Exercise habit strength, planning and the theory of planned behaviour: An action control approach. *Psychology of Sport and Exercise*, *12*(2), 106-114.

de Vet, E., Oenema, A., & Brug, J. (2011). More or better: Do the number and specificity of implementation intentions matter in increasing physical activity?. *Psychology of Sport and Exercise*, *12*(4), 471-477.

Dishman, R. K. (1991). Increasing and maintaining exercise and physical activity. *Behavior Therapy*, *22*(3), 345-378.

Eagly, A. H., & Chaiken, S. (1993). *The psychology of attitudes*. Harcourt brace Jovanovich college publishers.

Faul, F., Erdfelder, E., Buchner, A., & Lang, A. G. (2009). Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Behavior Research Methods*, *41*(4), 1149-1160.

Forster, H. A., Zaval, L., Jachimowicz, J., Berry, D., & Weber, E. U. (2020). *Friends With Benefits: Social Accountability Increases Physical Activity.* Manuscript submitted for publication.

Gardner, B., & Rebar, A. L. (2019). Habit formation and behavior change. In *Oxford Research Encyclopedia of Psychology*.

Gollwitzer, P. M. (1999). Implementation intentions: Strong effects of simple plans. *American Psychologist*, *54*(7), 493.

Gollwitzer, P. M., & Brandstaetter, V. (1997). Implementation intentions and effective goal pursuit. *Journal of Personality and Social Psychology, 73,* 186-199.

Guadagno, R. E., & Cialdini, R. B. (2010). Preference for consistency and social influence: A review of current research findings. *Social Influence*, *5*(3), 152-163.

Hagger, M. S., Chatzisarantis, N., & Biddle, S. J. (2001). The influence of self-efficacy and past behaviour on the physical activity intentions of young people. *Journal of Sports Sciences*, *19*(9), 711-725.

Hall, P. A., Zehr, C. E., Ng, M., & Zanna, M. P. (2012). Implementation intentions for physical activity in supportive and unsupportive environmental conditions: An experimental examination of intention–behavior consistency. *Journal of Experimental Social Psychology*, *48*(1), 432-436.

Hallal, P. C., & Victora, C. G. (2004). Reliability and validity of the international physical activity questionnaire (IPAQ). *Medicine & Science in Sports & Exercise*, *36*(3), 556.

Hansen, B. H., Kolle, E., Dyrstad, S. M., Holme, I., & Anderssen, S. A. (2012). Accelerometer-determined physical activity in adults and older people. *Medicine & Science in Sports & Exercise*, *44*(2), 266-272.

Holland, R. W., Verplanken, B., & Van Knippenberg, A. (2002). On the nature of attitude–behavior relations: The strong guide, the weak follow. *European Journal of Social Psychology*, *32*(6), 869-876.

Hollenbeck, J. R., Williams, C. R., & Klein, H. J. (1989). An empirical examination of the antecedents of commitment to difficult goals. *Journal of Applied Psychology*, *74*(1), 18.

Hoyert, M., Ballard, K., & O'Dell, C. (2019). Increasing student success through a cocktail of cognitive interventions. *Journal of the Scholarship of Teaching and Learning*, *19*(1). 128-134

IPAQ Research Committee. (2005). Guidelines for data processing and analysis of the international physical activity questionnaire (IPAQ)-short and long forms. *http://www.ipaq.ki.se/scoring.pdf*.

Jackson, C., Smith, A., & Conner, M. (2003). Applying an extended version of the theory of planned behaviour to physical activity. *Journal of Sports Sciences*, *21*(2), 119-133.

Keppel, G., Saufley, W. H., & Tokunaga, H. (1992). *Introduction to design and analysis: A student's handbook*. Macmillan.

Lally, P., Van Jaarsveld, C. H., Potts, H. W., & Wardle, J. (2010). How are habits formed: Modelling habit formation in the real world. *European Journal of Social Psychology*, *40*(6), 998-1009.

Lee, P. H., Macfarlane, D. J., Lam, T. H., & Stewart, S. M. (2011). Validity of the international physical activity questionnaire short form (IPAQ-SF): A systematic review. *International Journal of Behavioral Nutrition and Physical Activity*, *8*(1), 115.

Matthews, C. E., Chen, K. Y., Freedson, P. S., Buchowski, M. S., Beech, B. M., Pate, R. R., & Troiano, R. P. (2008). Amount of time spent in sedentary behaviors in the United States, 2003–2004. *American Journal of Epidemiology, 167*(7), 875-881.

McAuley, E., Jerome, G. J., Elavsky, S., Marquez, D. X., & Ramsey, S. N. (2003). Predicting long-term maintenance of physical activity in older adults. *Preventive Medicine*, *37*(2), 110-118.

Millon, T., Lerner, M. J., & Weiner, I. B. (2003). *Handbook of psychology: Volume 5, personality and social psychology*. (pp. 353-382). New Jersey: John Wiley & Sons, Inc.

Müller, B. C., van Someren, D. H., Gloudemans, R. T., Van Leeuwen, M. L., & Greifeneder, R. (2017). Helping made easy: Ease of argument generation enhances intentions to help. *Social Psychology, 148,* 113-121.

Munson, S. A., Krupka, E., Richardson, C., & Resnick, P. (2015). Effects of public commitments and accountability in a technology-supported physical activity intervention. In *Proceedings of the 33rd Annual ACM Conference on Human Factors in Computing Systems* (pp. 1135-1144).

Myors, B. (2006). Statistical power. *The Psychology Research Handbook*, 161-172.

Nyer, P. U., & Dellande, S. (2010). Public commitment as a motivator for weight loss. *Psychology & Marketing*, *27*(1), 1-12.

Paterson, D. H., & Warburton, D. E. (2010). Physical activity and functional limitations in older adults: A systematic review related to canada's physical activity guidelines. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 38.

Pauling, F. J., & Lana, R. E. (1969). The effects of pretest commitment and information upon opinion change. *Educational and Psychological Measurement*, *29*(3), 653-663.

Polder, J. J., Hoogenveen, R., Luijben, G., Van den Berg, M., Boshuizen, H. C., & Slobbe, L. (2012). *Zorgkosten van ongezond gedrag en preventie* (No. 2012-2). Rijksinstituut voor Volksgezondheid en Milieu.

Prestwich, A., Sheeran, P., Webb, T. L., & Gollwitzer, P. M. (2015). Implementation intentions. *Predicting Health Behaviour, 3rd ed. New York: McGraw Hill*, 321-57

Qualtrics, I. (2013). Qualtrics. *Provo, UT, USA*.

Rhodes, R. E., & de Bruijn, G. J. (2013). How big is the physical activity intention–behaviour gap? A meta-analysis using the action control framework. *British Journal of Health Psychology*, *18*(2), 296-309.

Rhodes, R., de Bruijn, G. J., & Matheson, D. H. (2010). Habit in the physical activity domain: Integration with intention temporal stability and action control. *Journal of Sport and Exercise Psychology, 32*(1), 84-98.

Ruegsegger, G. N., & Booth, F. W. (2018). Health benefits of exercise. *Cold Spring Harbor Perspectives in Medicine*, *8*(7), a029694.

Sallis, J. F., & Saelens, B. E. (2000). Assessment of physical activity by self-report: Status, limitations, and future directions. *Research Quarterly for Exercise and Sport*, *71*(2), 1-14.

Schienker, B. R., Dlugolecki, D. W., & Doherty, K. (1994). The impact of self-presentations on self-appraisals and behavior: The power of public commitment. *Personality and Social Psychology Bulletin*, *20*(1), 20-33.

Schunk, D. H. (1990). Goal setting and self-efficacy during self-regulated learning. *Educational Psychologist*, *25*(1), 71-86.

Sheeran, P., & Webb, T. L. (2016). The intention–behavior gap. *Social and Personality Psychology Compass*, *10*(9), 503-518.

Staats, H., Harland, P., & Wilke, H. A. (2004). Effecting durable change: A team approach to improve environmental behavior in the household. *Environment and Behavior*, *36*(3), 341-367.

Vandelanotte, C., De Bourdeaudhuij, I., Philippaerts, R., Sjöström, M., & Sallis, J. (2005). Reliability and validity of a computerized and dutch version of the international physical activity questionnaire (IPAQ). *Journal of Physical Activity and Health*, *2*(1), 63-75.

Wang, F., McDonald, T., Reffitt, B., & Edington, D. W. (2005). BMI, physical activity, and health care utilization/costs among medicare retirees. *Obesity Research*, *13*(8), 1450-1457.

Warburton, D. E., Charlesworth, S., Ivey, A., Nettlefold, L., & Bredin, S. S. (2010). A systematic review of the evidence for canada's physical activity guidelines for adults. *International Journal of Behavioral Nutrition and Physical Activity*, *7*(1), 39.

Warner, L. M., Schüz, B., Wolff, J. K., Parschau, L., Wurm, S., & Schwarzer, R. (2014). Sources of self-efficacy for physical activity. *Health Psychology*, *33*(11), 1298.

Webb, T. L., & Sheeran, P. (2006). Does changing behavioral intentions engender behavior change? A meta-analysis of the experimental evidence. *Psychological Bulletin*, *132*(2), 249.

Webb, T. L., & Sheeran, P. (2008). Mechanisms of implementation intention effects: The role of goal intentions, self-efficacy, and accessibility of plan components. *British Journal of Social Psychology*, *47*(3), 373-395.

World Health Organization. (2003). *Health and development through physical activity and sport*. World Health Organization.

World Health Organization. (2010). *Global recommendations on physical activity for health*. World Health Organization.

World Health Organization. (2016). *Netherlands physical activity factsheet*. World Health Organization.

worth, B. E., Haskell, W. L., Leon, A. S., Jacobs Jr, D. R., Montoye, H. J., Sallis, J. F., & Paffenbarger Jr, R. S. (1993). Compendium of physical activities: Classification of energy costs of human physical activities. *Medicine and Science in Sports and Exercise*, *25*(1), 71-80.

Yang, G., Niu, K., Fujita, K., Hozawa, A., Ohmori-Matsuda, K., Kuriyama, S., ... & Miura, C. (2011). Impact of physical activity and performance on medical care costs among the Japanese elderly. *Geriatrics & Gerontology International, 11*(2), 157-165.

Appendix A – Short version International Physical Activity Questionnaire

Introduction text:

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. **Vigorous** physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think *only* about those physical activities that you did for at least 10 minutes at a time.

1. During the **last 7 days**, on how many days did you do **vigorous** physical activities like heavy lifting, digging, aerobics, or fast bicycling?

    _____ **days per week**

    ☐ No vigorous physical activities → ***Skip to question 3***

2. How much time did you usually spend doing **vigorous** physical activities on one of those days?

    _____ **hours per day**

    _____ **minutes per day**

    ☐ Don’t know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. **Moderate** activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week**

☐ No moderate physical activities → ***Skip to question 5***

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you have done solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time?

_____ **days per week**

☐ No walking → ***Skip to question 7***

6. How much time did you usually spend **walking** on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐ Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, or sitting or lying down to watch television.

7. During the **last 7 days**, how much time did you spend **sitting** on a **week day**?

   _____ **hours per day**

   _____ **minutes per day**

   ☐ Don't know/Not sure

This is the end of the questionnaire, thank you for participating.