

Master Thesis

Encouraging Stair Use Among Office Users: The Effect of Nudging Interventions in an Office Environment



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Abstract

Because of the improvements in the information and computer technology, office workers sit a considerably part of their working day nowadays. At the same time, these individuals do not compensate this by increasing their physical activity levels or reducing their sitting behaviour during leisure time. In order to get physical activity throughout the (working) day, stair use can be encouraged. Nudges can be helpful in order to stimulate stair use in the office environment. Nudges are small adjustments in the environment, which are able to steer individuals in a particular direction.

The objective of this research is to find out if nudging interventions are effective to stimulate stair use of office users by investigating what influence nudging interventions could have on the stair use of employees in the office environment. The empirical study is executed at a Dutch online organisation as case organisation and by conducting observations (14,357 observation moments in five observation weeks) and a survey questionnaire (filled in by $\approx 46.18\%$). The nudging interventions were posters next to the elevators (week 2) and footprints placed on the floor, leading to the stairs (week 4). In the other three weeks, no nudging intervention was placed. A paired samples t-test showed that there were significant differences ($p < 0.15$) in stair use between week 3 and 4, week 4 and 5 and week 2 and 4. This research shows that the footprints as nudging intervention were more effective than the posters in order to stimulate stair use in office environments.

Key words: nudging, nudging intervention, stair use, office environment

Management summary

Background:

Because of the improvements in the information and computer technology, office workers sit a considerably part of their working day nowadays. At the same time, these individuals do not compensate this by increasing their physical activity levels or reducing their sitting behaviour during leisure time. In order to get physical activity throughout the (working) day, stair use can be encouraged. Nudges can be helpful in order to stimulate stair use in the office environment. Nudges are small adjustments in the environment, which are able to steer individuals in a particular direction.

Several researchers have conducted research about increasing stair use over elevators in office environments. However, these studies mutually have different outcomes with respect to the effectiveness of nudging interventions regarding stair use of office users. Therefore, it is not conclusive yet what the influence of nudging interventions are on stair use. The objective of this research is to find out if nudging interventions are effective to stimulate stair use of office users by investigating what influence nudging interventions could have on the stair use of employees in the office environment.

Methodology:

A case study is conducted at the headquarters of a Dutch online retailer in order to investigate the influence of nudging interventions on stair use. This was done with a pre-test/post-test study design. 14,357 observations have taken place for five weeks and one survey questionnaire is filled in by approximately 46.18% of the employees who work at the headquarters of the Dutch online retailer. The aim of the observations was to find out the effectiveness of the nudging interventions on the stair use of the headquarters users from the case organisation. The observation period began with a baseline observation week, in which no intervention had been implemented. In the second observation week the first nudging intervention (a poster) was placed. In the third observation week the first intervention was removed (first control week) and in the fourth week the second nudging intervention (footprints) had been implemented. Finally, in the fifth week the second intervention was removed (second control week).

Next to the being observed, the employees were also asked to fill in a survey questionnaire. The outcomes of the survey questionnaire were used to find out the experiences of the employees regarding the nudging interventions.

Results:

The obtained data regarding the observations showed that the weekly stair use has slightly increased from week 1 (67.11%) to week 2 (68.65%), more or less decreased in week 3 (67.47%), to some degree increased in week 4 (71.14%) and slightly decreased in week 5 (65.38%). However, it is remarkable that the stair use over the five weeks had decreased (-1.73%). This result can probably be explained due to the high standard deviation of the stair use in the baseline week (SD: 7.3990) and the relatively low standard deviation of the fifth week (SD: 2.0406).

The obtained data regarding the survey questionnaire showed that the majority of the respondents did have a neutral or negative attitude towards the influence of the posters on them regarding choosing for the stairs up to now (82.2%) and in the future (78.9%). The same result occurs regarding the footprints (up to now: 80.3%; in the future: 81.9%). However, the opinions regarding the nudging interventions were predominantly positive: 83.1% of the respondents had a positive attitude towards the posters; 81.5% of the respondents were positive about the footprints.

Conclusion:

This research shows that the footprints as nudging intervention were more effective than the posters. The posters were not effective in order to stimulate the stair use of office users. Although after implementing the posters the stair use slightly increased (+1.54%), but this change was not significant. After removing the posters the stair use decreased again (-1.18%), however, this decrease was not significant.

On the other hand, the footprints were effective in order to stimulate the stair use of office users. After implementing the footprints the stair use significantly ($p=0.1345$) increased (+3.67%) and after removing the footprints the stair use significantly ($p=0.0305$) decreased (-5.76%).

Two possible explanations for this result could be the location and the appearance of the nudging interventions. In case the implemented nudging intervention is clearly visible and the nudging intervention is perceived as fun, engaging and incorporated creative visuals instead of text, the nudging intervention would be more effective.

Preface

This report concerns a study about the effectiveness of nudging interventions in order to stimulate stair use of office users in the office environment. This research is conducted as a thesis as part of the Master program 'Management, Economics and Consumer Studies', within the specialisation profile Facility Management, at Wageningen University and Research.

This report could not have been realised without the support and help of several people and one organisation. Therefore, I would like to thank the following people.

Firstly, I would like to express my gratitude to Herman Kok for his guidance and constructive feedback. Secondly, I would like to thank Gerben van der Velde for his advice regarding the statistical analysis. Due to my supervisor(s), I was able to develop my scientific skills and to conduct this research.

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Finally, I would like to thank my family and friends for supporting me during this research. I worked with pleasure on this Master thesis and I hope that reading this report also pleases you.

Wageningen, 27th of June 2018

Iris van der Meiden

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1. Introduction

1.1 Background

The past few decades the nature of office work has changed substantially. The amount of work tasks regarding sitting at a computer has increased tremendously, due to the improvements in the information and computer technology (Healy et al., 2012; Miller & Brown, 2004). The expansion of time spent sitting at a computer and the availability of email has led to office workers who are no longer required to stand up intermittently to carry out certain work tasks. They do not even have to move from their desk for simple activities such as communicating with colleagues or filing (Healy et al., 2012; Shrestha et al., 2016). At the same time, the results of several studies found by Clemes et al. (2014) show that individuals who sit a considerably part of their working day do not compensate this by increasing their physical activity levels or reducing their sitting behaviour during leisure time.

Several researchers found that on average employees spent 66-67% of their work time at sitting at their own desk (Ryan et al., 2011; Ryde et al., 2013). According to Brown et al. (2003) the increase of physical inactivity and sedentary behaviour (e.g. sitting) contributes to the current overweight and obesity epidemic. Besides this, Owen et al. (2008) claim that too much and prolonged sitting is also a new and potential important risk factor for the development of chronic diseases. They underline that even if people get their recommended 30 minutes of physical activities on most days each week, that there may be significant negative health effects due to prolonged sitting (Owen et al., 2008). Therefore, it is important that individuals get their physical activity throughout the day. One opportunity for the short bouts of activity throughout the day is encouraging stair use instead of elevators, escalators or moving walkways (at airports e.g.) (Andersen, 2006). Stair use is an easy way to increase physical activity, because stairs are required in multi-story buildings and stair use requires no personal financial cost (Kerr et al., 2004). Vanden Auweele et al. (2005, p.188) believe that "[...] promoting stair use may be a very efficient way to increase the physical activity, and consequently the health of sedentary people". The degree of how people show healthy behaviour is influenced by several variables, including demographic variables (Booth et al., 2001). Next to the health benefits which come along with using the stairs, another advantage shows up: the reduction of electricity consumption and individual's carbon footprint (Ford, 2015).

An opportunity in order to encourage the stair use within the office environment could be nudging. Nudges could appear as written information, pictures, signs, colour rules or guidance. Some examples of nudges are a fly sticker in men's toilets to reduce cleaning costs, labelling healthy products green and unhealthy products red and asking customers 'Would you like to downsize your meal?' in a fast food restaurant (Curtis, 2014). "The central idea of *Nudge* is that 'small and apparently insignificant details can have major impacts on people's behaviour'." (Thaler & Sustein, 2008, in Wilkinson, 2013, p.341). Several researchers have conducted research about increasing stair use over elevators in office environments (Åvitsland et al., 2017; Kerr et al., 2004; Van Hoecke et al., 2018). However, the results of these studies do not correspond with each other. Åvitsland et al. (2017) found that the stair use in the attended offices was significantly reduced during their intervention periods. According to the researchers the nudges (stair-riser banners and footprints) were probably interpreted as nagging and led to the opposite of the desired behaviour. Kerr et al. (2004) obtained significant results regarding the increased stair use in offices with the help of motivational signs and music interventions. Van Hoecke et al.

(2018) found that footprints resulted in a significant increase in stair climbing at the worksite setting. The implementation of an additional health message referring to the footprints led to a further rise of the stair use. However, after the implementation of an additional message where stair users were congratulated, the stair use did not increase.

1.2 Problem statement

As mentioned in the previous paragraph several researchers have conducted research about increasing stair use over elevators in office environments (Van Hoecke et al., 2018; Åvitsland et al., 2017; Swenson & Siegel, 2013; Kwak et al., 2007; Kerr et al., 2004).

However, these studies mutually have different outcomes with respect to the effectiveness of nudging interventions regarding stair use of office users. Therefore, it is not conclusive yet what the influence of nudging interventions is on stair use. Accordingly, the scientific relevance of this research is finding out the effectiveness of nudging interventions on stair use of office users in office environments.

The practical relevance of this study is to create a better understanding of with which nudging interventions individuals could be encouraged to use the stair more often, so that they get more physical activity during their working day.

The objective of this research is derived from the scientific and practical relevance. The objective of this research is to find out if nudging interventions are effective to stimulate stair use of office users by investigating what influence nudging interventions could have on the stair use of employees in the office environment.

1.3 Research questions

From the above mentioned research objective, the main research question is derived. The main research question of this research is:

*To what extent does a **nudging intervention** influence the **stair use** of employees in the **office environment**?*

To answer this main research question, the following sub research questions have been formulated:

Theoretical sub-questions

1. How can stair use in the office environment be operationalised and measured?
2. How can nudging interventions be operationalised and measured?
3. Which possible nudging interventions are helpful to encourage the stair use in the office environment?

Empirical sub-questions

1. To what extent is the stair use in the office environment before, during and without the nudging intervention?
2. How did the office users experience the nudging intervention regarding stair use?

1.4 Research framework

According to Verschuren and Doorewaard (2010, p.16) a research framework is “[...] a schematic representation of the most important research phases” and the steps which need to be taken to achieve the research objective. The research framework for this research is given below (figure 1).

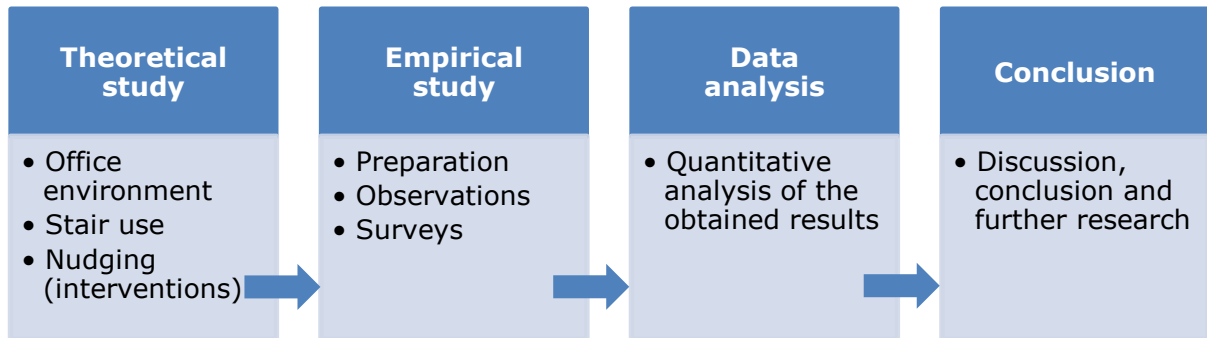


Figure 1: Research framework

1.5 Research outline

After this first chapter with the introduction of the research, follows chapter 2. This chapter contains the theoretical framework, in which the concepts office environment, stair use and nudging interventions are stated. Chapter 2 ends with the conceptual framework of this research.

Chapter 3 is about the research methodology. In this chapter the research design, the methods of data collection, the procedure of measures and the data analysis are outlined. This research methodology chapter ends with the reliability and validity of the research.

Chapter 4 describes the results of the empirical study. This chapter gives an overview regarding the responses on the used research methods, the effects of the nudging interventions and the experiences regarding the nudging interventions.

Chapter 5 contains the conclusion and discussion of this research. Furthermore, the limitations and recommendations for further research are given.

2. Theoretical framework

This chapter describes the theoretical framework of this research. Firstly, stair use in the office environment is introduced. Secondly, the nudge theory and nudging interventions are discussed. Thirdly, possible nudging interventions which could help to encourage the stair use in the office environment are stated. Finally, the conceptual framework is shown.

2.1 Stair use in the office environment

Before we are able to define stair use in the office environment, it is important to outline the two aspects which are the basis of this concept: the office environment and stair use. In the following sub paragraphs each aspect is explained.

The office environment

In the twentieth century the working patterns have changed structurally. In the beginning of the twentieth century, the focus of the economy was mainly on the extraction of raw materials and the production of goods. In this period product inventions, such as the tractor and the combine harvester, took place. At the same time, the assembly line was being developed by Henry Ford, which made mass production possible (Mobach, 2009).

According to Gabardo et al. (2017) the work patterns change is characterised by the continuous decline in labour in the agricultural sector and the rapidly, but steady, increase in labour in the manufacturing and service industry. At the time that in the manufacturing industry more and more labour was done automatically due to several new developed technologies, human labour had become redundant in some sectors. The increasing adoption of these new technologies has led to the shift in jobs towards the service industry (WCED, 1987). Over the years, the tasks of employees changed from physical work in production environments to desk work (knowledge-intensive work) in office environments (Towe et al., 1997). An office is: "A room, set of rooms, or building used as a place for commercial, professional, or bureaucratic work." (Oxford Dictionaries, 2018b). The purpose of the office environment is to create conditions in which individuals and groups can perform administrative, knowledge and creative work (Kok, 2016), and where they can create and transfer knowledge (Vischer, 2008). These individuals and groups are knowledge workers: key employees who create intangible value-added assets (Harrigan & Dalmia, 1991). According to Bodin Danielsson (2015) there are seven identified office types in the office environment: 1) cell-office, 2) shared-room office, 3) small open plan office, 4) medium-sized open plan office, 5) large open plan office, 6) flex-office and 7) combi-office. The cell office is the most remarkable type, because all other office types imply sharing the workplace and services to a greater or lesser extent, whereas employees in cell offices do not have to share anything.

The office environment is characterised by physical, psychological and functional factors, which together create the overall environment (Bodin Danielsson, 2015). Physical factors can be described as factors regarding health and safety, such as protection, light, indoor air quality, climate, noise and ergonomics. Examples of psychological factors, which relates to individual and interpersonal space-related needs, are privacy, crowding, territoriality and control over the environment. Functional factors refer to the appropriateness of the work environment for the work tasks, like disturbances and distractions, interruptions, distances between direct colleagues, supervisors, resources and functional areas (Feige et al., 2013; Bitner, 1992). When this overall environment, consisting of physical, psychological and functional factors, is positively perceived by the presence of pleasant sensations, office workers feel comfortable in their work environment (Feige et al., 2013).

Bitner (1992) claims that employees respond to their environment holistically. This means that "[...] though individuals perceive discrete stimuli, it is the total configuration of stimuli that determines their responses to the environment." (Bell et al., 1978; Holahan, 1982; Ittelson et al. 1974; in Bitner 1992, p.65). Individuals can respond to the environment in a cognitively, emotionally, and physiologically way. These internal responses influence the individual behaviour of the office worker (in the form of approaching or avoiding the environment) and the social interaction in the office environment (Mehrabian & Russell, 1974, in Bitner, 1992).

Nowadays, it is important for organisations to optimise the office environment, because of the fact that these organisations are highly dependent on the productivity and performances of their office workers. In order to create a supportive work environment and to stimulate the performances of employees, it is important to have a good fit between the work environment and the type of work that employees perform. When the spatial design and type of work are aligned, organisations are able to perform better (Fayol, 1917, in Mobach, 2009; Bock et al., 2005; Peponis et al., 2007).

Due to modern office design where multiple floors is more or less standard, employees can choose between stairs and elevators among other things to move between floors (Eves et al., 2006). In the next sub paragraph the aspect stair use is clarified.

Stair use

Since time immemorial, stairs are being used to move from lower situated floors to higher situated floors or vice versa. Stairs are: "A set of steps leading from one floor of a building to another, typically inside the building." (Oxford Dictionaries, 2018c). It took hundreds of years before a second option could be developed to get up one floor: the elevator. An elevator is "A platform or compartment housed in a shaft for raising and lowering people or things to different levels." (Oxford Dictionaries, 2018a). In 1853 Elisha Graves Otis showed the world's first safe elevator at the Crystal Palace Exposition in New York. Due to this invention modern skyscrapers could be built (Giedion, 2002) and enabled the emergence of the current skylines in different cities over the globe.

Nowadays, most office buildings consist of several or many floors. In these buildings employees can only choose between stairs, elevators and escalators to go up one floor (Eves et al., 2006). However, the two most commonly used ones in office buildings are stairs and elevators. The reason for choosing for the stairs or the elevator could be dependent on several factors.

Firstly, the choice between stairs and the elevator is dependent on the number of floors which have to be covered. Office users might choose the stairs for short journeys to the next (nearby) floor, but might wait for the elevator when they have to go up to a floor which is situated several floors away (Eves et al. 2006). Kwak et al. (2007) found that according to office workers the number of floors is one of the important considerations in the choice to take the stairs or elevator. Subsequently, Kerr et al. (2001a) identified that the floor on which the employee works, is one of the barriers to use the stairs in the office. Employees who work on lower floors use the stairs more often than colleagues who work on higher floors (Kerr et al., 2001a).

Secondly, the reason for choosing between the stairs and elevator is dependent on the physical accessibility and visibility of the stairs and elevators. According to Weghorst (2016), in most office buildings the elevators are both physically and visually more accessible than the stairs. The stairs in office environments are often situated at a little distance from the elevator and are not immediately visible (Eves & Webb, 2006). Van

Nieuw-Amerongen et al. (2011) studied the effects of enhancing the accessibility and visibility of the stairwell in an university building. They found that improving the visibility and accessibility of the stairs has a positive and continuous influence on the total stair use.

Thirdly, the choice between stairs and elevator also depends on waiting time. The stairs are immediately and continuously available, whereas for using the elevator office users have to wait until the elevator arrives. Because of the fact that it cannot be clear at what time the elevator is available, it could influence the choice between the stairs and elevator. Waiting time tempers the journey and the uncertainty regarding the elevator availability can be perceived as a barrier (Olander & Eves, 2011; Kerr et al., 2001b). However, on the other hand, an office user aiming to use the stairs could also be persuaded by an elevator which is immediately available (Eves et al., 2006). Office users will probably choose for the first available or quicker option.

Finally, the reason for choosing the stairs or elevator could also be influenced by the individual physical fitness and the motivation to get more physical activity during work time. Every morning an office employee comes to the office to work or during the work day he or she faces the circulation space several times a day. At that time, the employee has to make a decision between the stairs and elevator and could encounter the stairs as a suitable occasion to start or continue exercise (Reeve, 2014). Namely, stair climbing requires more energy expenditure than stair descent or standing in the elevator (Eves et al., 2006).

Stair use in the office environment

Now the two aspects office environment and stair use are outlined, we are able to define stair use in the office environment. Stair use in the office environment is when an office worker uses the stairs in case this person completes all the steps (the number of risers) of the stairs and arrives at a higher situated floor of the office building.

The stair use in the office environment can be influenced by the amount of floors in the office building, the physical accessibility and visibility of the stairs and elevator, the amount of waiting time, the individual physical fitness and the motivation to get more physical activity during work time.

2.2 Nudging interventions

Every day people have to make a lot of choices, like 'What do I wear today?', 'What do I eat this evening?' and 'Who do I vote for in today's election?'. Some choices are made consciously, but most of them are made unconsciously. Examples of conscious choices are choosing for an education or specific job, having kids or not, whereas unconscious choices are changing lanes on the highway and choosing your sandwich filling at lunch time for example. The unconsciously choices take place via the 'automatic system' (system 1): a cognitive human system which is evolutionary old and is shared with other animals (Evans, 2003). Because of the fact that the human's mind has limited working memory capacity, this automatic system is necessary. "System 1 includes instinctive behaviours that are innately programmed [...]." (Evans, 2003, p.454).

The consciously choices happen via the 'reflective system' (system 2): a cognitive human system which is evolutionarily recent and distinguishes human beings from other animals. Due to this system, humans are able to reason and think hypothetically. System 2 requires working memory, has low processing capacity which requires high effort and the exclusion of attention to other things (Evans, 2003).

The common track regarding behavioural change in psychology and economics has been focused on 'change minds' by influencing how people think. Hagman et al. (2015) claim that research in psychology and behavioural economics identified that people do not have steady values which they consider when making behavioural decisions. Alternatively, people do use any information which is available at the moment of behavioural decision making. This is the core of the nudge theory: behavioural choices of individuals can be systematically changed by means of changing small features in the environment. Dolan et al. (2012) found that there is increasing evidence that behaviour can highly be influenced through 'changing contexts' (the environment), instead of 'changing minds'.

When the context, also known as the 'choice architecture', has been changed, people are being 'nudged' to a certain direction. Thaler and Sunstein (2008, p.8) defined a nudge as "[...] any aspect of the choice architecture that alters people's behaviour in a predictable way without forbidding any options or significantly changing their economic incentives." So in other words, nudges are able to steer individuals in a particular direction, but the nudges also allow these individuals to go their own way (Apollonsky, 2015).

According to Lunt and Staves (2011, p.42) "[...] nudges are designed to increase the likelihood that the more 'responsible', or 'paternal' choice is made from a 'choice architecture'." Nudges can be characterised as low-cost interventions, which "[...] enables individuals to make decisions that they judge to be their own personal decision and to act without triggering conscious realisation." (Lunt & Staves, 2011, p.42).

As mentioned earlier, nudges could appear as written information, pictures, signs, colour rules or guidance. Some examples of nudges are a fly sticker in men's toilets to reduce cleaning costs, labelling healthy products green and unhealthy products red in a supermarket or canteen and asking customers 'Would you like to downsize your meal?' in a fast food restaurant (Curtis, 2014).

Because of the fact that nudging is a very broad concept, several researchers have classified this term into categories (Science and Technology Committee, 2011; Kolstad et al., 2014). Dolan et al. (2012) divided the concept nudging into nine categories, also known as the MINDSPACE framework. With the use of the MINDSPACE framework, people are able to improve the effectiveness of existing and new behaviour change policies. On the next page the MINDSPACE framework is shown (Dolan et al., 2012).

Cue	Behaviour	Examples of application
Messenger nudge	Individuals are greatly influenced by the person who communicates information to them.	Experts which know a lot about and have the expertise regarding a certain topic, for example lung doctors concerning smoking.
Incentive nudge	Individuals could be motivated by giving something or could be punished by taking something.	Car insurers in the Netherlands follow a bonus/malus system: the more claim-free years, the higher the discount the customer receives.
Norm nudge	Individuals are heavily influenced by what others do and they compare themselves to other people.	In case certain behaviour has to be minimised: energy use in comparison to neighbours; or maximised: recycling towels during a hotel visit.
Default nudge	Individuals could make a decision easier, because of the pre-set choice options.	Recently the default nudge is used by the Dutch Government regarding organ donation. All adults in the Netherlands are organ donors automatically, unless they opt out.
Salience nudge	Individuals are extremely influenced by what their attention is drawn to, especially to stimuli which are novel and simple.	Product taxes which are only mentioned on the receipt at the till or product taxes which are also individually mentioned at the price labels next to the products in the supermarket. An experiment showed that putting the tax next to the price labels led to a decrease of 8% in the sales. Another experiment showed that the alcohol sale declined due to putting the tax next to the price label.
Priming nudge	Individuals are influenced by verbal, physical and olfactory cues, which are able to change the behaviour unconsciously.	Footsteps in an office environment to encourage stair use, the spread of odour (smell of fresh bread in supermarkets) and small messages like '20 days to go before the tax return has to be filled in'.
Affect nudge	The emotions of individuals could powerfully shape their actions.	In case a brand is being stated several times as a negative brand for example, people can decide not to buy any product from this brand anymore or vice versa.
Commitment nudge	Individuals make decisions which are in line with their public promises and commitments.	In case the government wants to help smokers quit for example. In the experiment individuals were offered a savings account in which they deposited funds for 6 months. The smokers had to do a test for nicotine, where they promised to quit smoking. If they passed the test, then the individuals got their money returned. In case they did not pass the test, they lost the money.
Ego nudge	Individuals act in ways which make them feel good or better about themselves.	Female solicitors for door-to-door fund-raising, so that male donators donate more to charity.

Table 1: The MINDSPACE framework for behaviour change (Dolan et al., 2012).

It can be concluded that nudging interventions are able to steer individuals in a particular (desired) direction. Nudging interventions could be used for different purposes and each type could provoke a different behavioural effect.

2.3 Possible nudging interventions to encourage stair use

Several researchers have conducted research about increasing stair use over elevators in office environments. These studies are concisely stated in the table 2, see below. The table makes a distinction between the intervention and the type of intervention. The type of intervention is derived from the MINDSPACE framework (Dolan et al., 2012), which is shown in table 1.

Study	Year	Intervention(s)	Type of intervention (MINDSPACE)	Results
Van Hoecke et al.	2018	Footprints on the floor (1), a health message referring to the footprints (2) and individuals were congratulated for their increased stair use (3).	(1) Salience nudge (2) Priming nudge (3) Priming nudge	(1) Increase of stair use from 27.7% at baseline to 31.2% in the first intervention phase. (2) Increase of stair use with an additional 12.4% (to 43.6%) in the second intervention phase. (3) No further increase of stair use in the third intervention phase. - In follow-up phase a decrease of stair users, but still exceeded baseline (34.6%).
Åvitsland et al.	2017	Footprints on the floor (1) and combined intervention of footprints and stair-riser banners containing a positive feedback message, placed at every top stair riser (2).	(1) Salience nudge (2) Priming nudge	(1) Decrease of stair use from 79.0% at baseline to 73.9% in the first intervention period. (2) Decrease of stair use from 79.0% at baseline to 73.3% in the combined intervention period. - In follow-up period an increase of stair users, but did not exceeded baseline (75.0%).
Swenson & Siegel	2013	Multiple interactive and aesthetically pleasing paintings in the stairwells (1) and signs with a smiling figure and the words 'fun stairs' and 'in case of fun use stairs', which were intended to make people curious about the stairs instead of health reasons.	(1) Salience nudge	(1) Increase of stair use from 31.5% at baseline to 66.2% after a 6-week intervention period.

Andersen et al.	2012	Two similar buildings with two floors each received environmental prompts: a general health sign with 'Get fit, take the stairs' (1) and a specific weight control/loss sign with 'Burn one calorie for every six stairs' (2).	(1) Priming nudge (2) Priming nudge	(1+2) None of the buildings showed significant results. But the gained results suggest that environmental prompts may positively influence stair use. However, the researchers cannot conclude this because of the lack of significant results.
Kwak et al.	2007	Posters containing prompts in order to stimulate stair use in an office building with 9 floors and a paper factory, e.g. 'Free workout?', 'The stairs. A good idea!'.	Priming nudge	A short-term effect in increasing stair use of approximately 5%. The prompts were equally effective in both types of worksites.
Vanden Auweele et al.	2005	A 'health' sign that linked stair use to health and fitness (1) and an additional e-mail sent a week later by the worksite's doctor, pointing out the health benefits of regular stair use (2).	(1) Priming nudge (2) Messenger nudge	(1) Significantly increase of stair use from 69% at baseline to 77% in the week after the first intervention. (2) Significantly increase of stair use to 85% in the week after the second intervention. - In follow-up month a decrease to 67%, but this was not significantly different from baseline.
Kerr et al.	2004	New carpet and painted walls (1), framed artwork on stair landings (2), motivational signs (3) and a stereo system and playing various types of music in the stairwell (4).	(1) Saliency nudge (2) Saliency nudge (3) Priming nudge (4) Priming nudge	(1) Decrease of stair use of 0.5% compared to baseline. (2) Increase of stair use of 3.7% compared to baseline. (3) Increase of stair use of 4.2% compared to baseline. (4) Increase of stair use of 4.7% compared to baseline.
Kerr et al.	2001a	Poster with the words 'Stay healthy, use the stairs' to encourage stair use in two accountancy firms.	Priming nudge	No significant effect of the poster on stair climbing at worksite 1 (at baseline 20.7%, at poster intervention 21.5%). Slightly higher percentages at worksite 2, but still no significant effect of the poster on stair climbing (at baseline 19.0%, at poster intervention 23.2%).

Titze et al.	2001	Several interventions took place at four different offices, but not every intervention took place at all offices. The interventions were: provided written information regarding physical activity recommendations (1), provided apples and other fruits (2), game of chance (3) and one day the elevator was closed symbolically (4).	(1) Priming nudge (2) Incentive nudge (3) Salience nudge (4) Default nudge	Increase of stair use across four offices from 61.8% at baseline to 67.1% at the follow-up period.
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Table 2: Studies regarding encouraging stair use over elevators in office environments.

It can be concluded that several researchers have conducted studies about encouraging stair use in the office environment. These researchers all have studied different nudging interventions and most of them found that the nudging intervention(s) were effective and could be helpful to encourage the stair use in the office environment.

Table 3, which is stated below, shows the studied types of nudging interventions, the amount of studies which include the particular nudging intervention, the effect of the nudging intervention and the researchers who conducted these studies.

Type of nudging intervention	# of studies	Effect of the nudging intervention	Studies
Footprints	2	(1) <u>Increase</u> of stair use from 27.7% at baseline to 31.2% in the first intervention phase. (2) <u>Decrease</u> of stair use from 79.0% at baseline to 73.9% in the first intervention period.	(1) Van Hoecke et al. (2018) (2) Åvitsland et al. (2017)
Health sign/message	6	(1) <u>Significant increase</u> of stair use with an additional 12.4% (to 43.6%) in the second intervention phase. (2) <u>No significant result</u> , but the gained results suggest that environmental prompts may positively influence stair use. (3) A <u>short-term effect in increasing</u> stair use of approximately 5%. (4) Significantly <u>increase</u> of stair use from 69% at baseline to 77% due to the health sign. Significantly <u>increase</u> of stair use to 85% due to the health message. Follow-up month a decrease to 67%. (5) <u>No significant results</u> .	(1) Van Hoecke et al. (2018) (2) Andersen et al. (2012) (3) Kwak et al. (2007) (4) Vanden Auweele et al. (2005) (5) Kerr et al. (2001a) (6) Titze et al. (2001)

		(6) <u>Increase</u> of stair use from 61.8% at baseline to 67.1%. However, these results are gained simultaneously with two or three other interventions, so not significant.	
Motivational sign/message	3	(1) <u>No influence</u> on the previous gained results (neither an increase nor a decrease). (2) <u>Decrease</u> of stair use from 79.0% at baseline to 73.3% in the combined intervention period (footprints and motivational sign/message). (3) <u>Increase</u> of stair use of 4.2% compared to baseline.	(1) Van Hoecke et al. (2018) (2) Åvitsland et al. (2017) (3) Kerr et al. (2004)
Changes surroundings stairs	2	(1) <u>Increase</u> of stair use from 31.5% at baseline to 66.2%. (2) <u>Decrease</u> of 0.5%, <u>increase</u> of 3.7% and <u>increase</u> of 4.7% compared to the baseline.	(1) Swenson & Siegel (2013) (2) Kerr et al. (2004)
Other	1	(1) <u>Increase</u> of stair use from 61.8% at baseline to 67.1%. However, these results are gained simultaneously with two or three other interventions, so not significant.	(1) Titze et al. (2001)

Table 3: All nudging interventions which are helpful to encourage the stair use in the office environment.

2.4 Conceptual framework

According to the majority of the literature **nudging interventions** could help encouraging the **stair use** in the **office environment**. However, some researchers did not find any significant results regarding the effect of the nudging interventions, whereas a couple of researchers did even find a decrease of stair use after implementing the nudging interventions. Because of the fact that the majority of the literature found an increase of stair use after implementing nudging interventions, the researcher presumes that the nudging intervention in the office environment has a positive direct effect on the stair use of the office users, see figure 2.

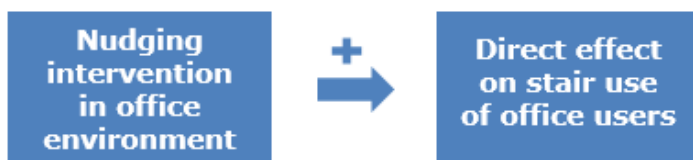


Figure 2: Conceptual framework

3. Research methodology

This chapter describes the research methodology. Firstly, the research design of this research is introduced. Secondly, the methods of data collection are discussed. Thirdly, the procedure of measures is stated. Fourthly, the analysis of the data is discussed. Finally, the reliability and validity of the research is stated.

3.1 Research design

The research design of this study is a quantitative one, because a quantitative research aims to measure using numbers. "Typical forms of quantitative research are surveys [...] and research based on administrative data, where, for example, the number of people who have been patients in a hospital each month is counted. [...] The aim is to create a numerical description [...]." (Gilbert, 2008, p.35).

There are several study designs in quantitative research, but the one which fits this research the best is a combination of the case study and pre-test/post-test study design. "The case study design is based upon the assumption that the case being studied is atypical of cases of a certain type and therefore a single case can provide insight into the events and situations prevalent in a group from where the case has been drawn. [...] It is a very useful design when exploring an area [...] where you want to have a holistic understanding of the situation, phenomenon, episode, site, group or community." (Kumar, 2011, p.126). In this research the case study design is a single case study, where just one case organisation will be studied (De Vaus, 2001). The case organisation in this research is a Dutch online retailer, which owns a couple of offices and warehouses in the Netherlands. With the pre-test/post-test study design it is possible to measure change in a situation, phenomenon or problem for example. It is the most appropriate design for measuring the impact of an intervention (Kumar, 2011). The objective of this research is to find out if nudging interventions are helpful to stimulate stair use, so the pre-test/post-test study design is particularly suitable for this research.

3.2 Methods of data collection

The primary research methods for this quantitative research are observations and a survey questionnaire. In the following sub paragraphs each method is discussed.

Observations

"Observation is a purposeful, systematic and selective way of watching and listening to an interaction or phenomenon as it takes place." (Kumar, 2011, p.134). It is a highly suitable method for studying the behaviour of an individual.

The type observation which has been applied during this research is non-participant observations. The researcher has been a passive observer. The researcher did not get involved in the activities of the group, but only watched and counted the observed persons (Kumar, 2011).

The research units of this research are the employees who work at the headquarters of the chosen Dutch online retailer. Any visitors who visited the headquarters during the observation period were also taken into account. They were taken into account, because the researcher was not able to make a clear distinction between employees and visitors. In this research no difference is made between these two groups.

The total population of employees working at the headquarters is around 550. The research units had been observed when they faced the point of choice at the ground floor: "The physical space where an individual is forced to make a decision between a mode of transportation." (Ford, 2015, p.5). The subjects faced a binomial choice: they used whether

the stairs or not. In case the individual did not use the stairs, he/she would automatically use the elevator. Only the units who used the stairs or elevator from the ground floor to go up to a higher floor were included in the research. The destination of the observed subjects has not been taken into account. The observed units had to 'finish' their journey to the first floor at least. Finishing the stair journey is when an individual completes all the steps (the number of risers) of the stairs and arrives at a higher situated floor of the office building. Finishing the elevator journey is when an individual steps out of the elevator when a higher situated floor of the office building is reached. In case a person did not finish the journey from the ground floor to the first floor at least, this observation moment had been excluded from the data. The observation moments where research units used the stairs or elevator to go down to the ground floor were excluded. Research units who used the stairs or elevator between the different floors, other than the ground floor, have not been observed.

The observation period has lasted for 5 weeks. The first week was a baseline observation week: no intervention had been implemented, observations took place. The first nudging intervention had been implemented and observations took place in the second week. In the third week the first intervention had been removed and observations took place. The second nudging intervention had been implemented and observations took place in the fourth week. In the final week the second intervention had been removed and the last observations took place. The aim of the observations was to find out the effectiveness of the nudging interventions on the stair use of the headquarters users from the case organisation.

The arrival of the researcher had been announced on the internal website of the Dutch online retailer. This had been done to inform the employees, because the position of the researcher was completely in sight. The observation location could not be somewhere else, because the researcher had to have a direct view on the stairs and elevators.

In case participants were interested in the observer while the observations took place and the participants were willing to ask questions regarding the research, the researcher told them a fictional story concerning conducting a research about 'Vitality at Work' at several big employers in the Netherlands. The researcher told this story, because of the fact that the employees were not allowed to immediately know that the research only focused on the stair (and elevator) use. Research topics which were mentioned during the conversations were 'Food choices in the canteen', 'Office Ergonomics', 'Walking outside during Breaks' and 'Smoking Habits'. To enforce the research about 'Vitality at Work' the researcher also observed the food choices in the canteen during lunch time, the office ergonomics at the workplaces and observed the persons who walked outside during lunch time. These 'extra' observations were done to prevent employees from knowing the actual reason of the research and from being influenced by other things than the nudging interventions. So, the employees were being left in a delusion for a couple of weeks.

Survey questionnaire

Next to observations, one survey questionnaire has been conducted. "A questionnaire is a written list of questions, the answers to which are recorded by respondents." (Kumar, 2011, p.138). The survey questionnaire is a suitable method for collecting data from a large population. "The great advantage of survey data is that they facilitate quantitative analysis that allows for generalization to an entire population." (Park, 2006, p.118).

The survey questionnaire was online accessible via the link which was mentioned on the company's intranet. Next to this, the researcher also wrote small notes, including the link to the survey questionnaire, with an attracting text to encourage employees to fill in the

survey questionnaire. These small notes were put down on the lunch tables during lunch time on the last observation day. In appendix E the small note is shown.

Employees were able to fill in the online survey questionnaire from the last observation day in the fifth observation week to a week afterwards. The researcher had chosen for this, so that in case respondents got questions on the first 'filling-in day', they were able to ask these questions to the researcher in person. The filling-in period lasted for one week, because then employees got the opportunity to fill in the online survey questionnaire at a moment which suited them the best.

The aim of the survey questionnaire was to find out the experiences of the employees regarding the nudging interventions. As mentioned before, the survey questionnaire was online accessible via the link on the company's intranet.

The survey questionnaire contained questions and statements about how the office users experienced the nudging interventions and consisted of a five point Likert scale. According to Kumar (2011, p.170) the Likert scale "[...] is based upon the assumption that each statement/item on the scale has equal attitudinal value, 'importance' or 'weight' in terms of reflecting an attitude towards the issue in question." The online survey questionnaire was a closed-ended survey: the questions and statements were given and demographic data of the employees were recorded, such as gender, age and education level. Each respondent got the same questions and statements in the same order. Examples of questions and statements are: 'Did you notice the posters next to the elevators on the ground floor?', 'Did you notice the footprints on the ground floor?' and 'I have the feeling that the yellow footprints on the ground floor have positively influenced me regarding choosing for the stairs instead of the elevator in the future.' Appendix D includes all survey questions and statements of the online survey questionnaire.

3.3 Procedure of measures

The two used research methods have had different procedures how the data is obtained. In the following sub paragraphs the procedure of measures of each research method is discussed.

Observations

The observation period has lasted for five weeks. The researcher has observed three days per week, so fifteen days in total. In the first four weeks the observation days were Monday, Tuesday and Thursday. In the fifth week the observation days were Monday, Tuesday and Wednesday, due to holidays. The fifth Thursday of the observation period the headquarters of the Dutch online retailer was closed. So, that is the reason why the researcher chose for bringing forward the last observation day.

The researcher started around 8:00h in the morning (except for the first day, starting time: 9:00h) and stopped around 13:30h in the afternoon. The researcher chose for these times, because the chance to get the most data regarding employees who used the stairs or elevator to go up one or more floor(s) is in the morning and after lunch time. Employees arrive at the office and go to their workplace in the morning and after lunch employees have to go back from the restaurant to their workplace again.

During the observations, the researcher used daily a tally table to order the obtained data. At the end of each observation day, the researcher counted the tally marks of that specific day. After that, the researcher put the obtained data in a 'general overview' table. After this, the researcher was able to implement the obtained data in the statistical computer program IBM SPSS Statistics 23.

The location where the observations took place was at the ground floor, next to the stairs and elevators. The researcher was able to see the stairs and elevators from one and the same spot. At the same time, the location was clearly in sight for employees and visitors, so the observer was continuously been noticed. In appendix A the map of the ground floor is shown. In this appendix the location of the observer is pointed out.

Week 1: Baseline

The observation period began with a baseline observation week. In this week no intervention had been implemented and observations took place. The aim of this baseline week was to measure the current stair use of the research population. The data obtained in the baseline week has been used for setting a base for measurements. The results of the baseline week were the starting point for analysing and comparing the data obtained in the other weeks of the observation period.

Week 2: First nudging intervention

After the baseline week, the first nudging intervention had been implemented. The type of the first intervention has been determined on the basis of the theoretical framework. Table 3 shows that the nudging intervention which is studied the most is the health signs/message. Because of the fact that the researcher wanted to contribute to the understanding of with which nudging interventions individuals could be encouraged to use the stair more often, the researcher had decided to select this nudging intervention for conducting the empirical data for this research. The health message has been designed in the form of a poster. After implementing the first intervention, observations took place. In appendices A and B the location where the poster had been put is shown.



Figure 3: Poster

Week 3: First control week

After the week the first nudging intervention had been implemented, the first control week took place. In the first control week the posters were removed before the researcher started observing. The aim of this first control week was to measure the effect of the posters on the stair use of the research units.

Week 4: Second nudging intervention

After the first control week, the second nudging intervention had been implemented. The type of the second intervention has been determined on the basis of the theoretical framework. As mentioned before, table 3 shows that the nudging intervention which is studied the most is the health signs/message. The second most studied nudging intervention is the motivational sign/message, but because this nudging intervention has overlap with the health sign/message, the researcher had decided that the motivational sign/message was not taken into account. After the top two, two types of nudging interventions are both studied twice: change surroundings stairs and footprints. The researcher was not able to change the surroundings of the stairs area in the time the research was being conducted. Next to this, the researcher did not have a large budget to change the surroundings of the stairs area. Conversely, footprints are low-cost and are easy to place and are removable. Therefore, the researcher had decided to select footprints as an



Figure 4: Footprints

appropriate second nudging intervention. The researcher had used yellow footprints, because of the fact that this colour would pointed out the best. The ground floor of the headquarters consists of black tiles. After implementing the second intervention in the fourth week, observations took place. In appendices A and B the location of the footprints is shown.

Week 5: Second control week

After the week the second nudging intervention had been implemented, the second control week took place. In the second control week the footprints were removed before the researcher started observing. The aim of this second control week was to measure the effect of the footprints on the stair use of the research units.

Beside observations in this week, the research units were also able to fill in the online survey questionnaire from the last observation day in the second control week to a week afterwards.

Survey questionnaire

The survey questionnaire has been made with the web based program Google Forms. With this program the researcher was able to spread the survey questionnaire online and via a link which was mentioned on the internal website of the Dutch online retailer. When a respondent clicked on the link, a small introduction was presented. After the introduction, a couple of questions regarding demographics and at which floor the respondent works were asked. Subsequently, one question and one statement regarding the current stair use of the respondent were asked. After that, the respondent had to answer three questions and two statements about the first nudging intervention. Next to this, the respondent had to answer three questions and two statements regarding the second nudging intervention as well. Afterwards, the respondent got a notification that the response was being saved and that the given answers are treated confidentially and anonymously. In case the respondent had any questions, he or she was able to email the researcher.

3.4 Data analysis

After data collection, the statistical analysis of the quantitative data had taken place. The outcomes of this analysis are used for answering the empirical sub-questions and the main research question. In the following paragraphs the data analysis regarding the observations and survey questionnaire is discussed.

Observations

The aim of the observations was to find out the effectiveness of the nudging interventions on the stair use of the headquarters users from the case organisation.

After obtaining the observation data with the help of the tally tables and the 'general overview' table, the researcher was able to implement the obtained data in the statistical computer program IBM SPSS Statistics 23. SPSS 23 is used for analysing the observations data.

After the implementation of the data in SPSS 23, the researcher was able to compare the outcomes of the weekly observations with each other. These comparisons were important for the determination of the effectiveness of the nudging interventions on the stair use of the employees of the Dutch online retailer. A paired samples t-test is used to find out the differences in stair use in week 1 (baseline) and 2 (first intervention), week 2 and 3 (first control week), week 3 and 4 (second intervention), week 4 and 5 (second control week), week 1 and 5 (the 'lasting' effect of the nudging interventions), week 1 and 4 and week 2 and 4. The outcomes were used to answer the first empirical sub question.

Figure 5 shows schematically the weeks which are studied and compared with each other. Due to these comparisons, the researcher was able to identify the effectiveness of the nudging interventions. In this paired samples t-test the dependent variable is the stair use, the independent variable is the environment including or excluding the nudging interventions.

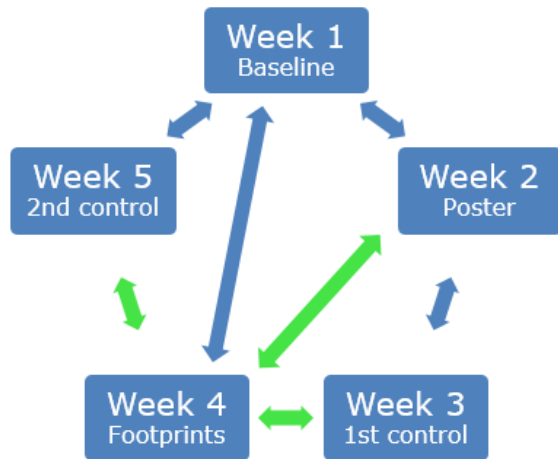


Figure 5: The studied and compared observation weeks.

Survey questionnaire

The aim of the survey questionnaire was to find out the experiences of the employees regarding the nudging interventions.

After obtaining the data with the help of the program Google Forms, the researcher was able to analyse the outcomes. The researcher transferred the obtained data to Google Spreadsheets (online version of Microsoft Excel) and used this program for creating pie charts.

Four statements, which were about the effects of the nudging interventions, substantiate the observation data. In these four statements respondents were asked if they have the feeling that the nudging intervention have positively influenced them up to now or in the future for choosing for the stairs instead of the elevator. The outcomes of these statements were used to create pie charts, to support the observation data and to answer the first empirical sub question.

Five other questions were asked to find out the experiences of the employees regarding the nudging interventions. These questions were about the visibility of the nudging intervention, the opinions of the respondents regarding the nudging interventions and one question about the message on the poster. The outcomes of these questions were used to create pie charts and to answer the second empirical sub question.

3.5 Reliability and validity

According to Heale and Twycross (2015), the quality of quantitative research is assessed by measuring the reliability and validity of the study. In the following sub paragraphs each aspect is discussed.

The reliability of a research refers to when the research methods and measurements show the same results on repeated occasions (De Vaus, 2001). In this research two research methods are used: observations and a survey questionnaire.

Firstly, a large number of observed research units and respondents is needed to ensure reliability. Verschuren and Doorewaard (2010) claim that the sample size have to be at least between 60 to 80 units.

Secondly, before sending out the online survey questionnaire, a sample survey questionnaire is filled in by a few respondents. This was done to filter out possible mistakes and misunderstandings, to check if the survey questionnaire could be filled in within the mentioned time frame and to increase the reliability of the outcomes.

The internal validity of a research refers to “[...] the extent to which the structure of a research design enables us to draw unambiguous conclusions from our results.” (De Vaus, 2001, p.28). In this research the theoretical framework, which consists of diverse sources and studies, provides a good start to develop the empirical study, which increases the internal validity.

The external validity of a research refers to “[...] the extent to which results from a study can be generalised beyond the particular study” (De Vaus, 2001, p.28) and if the outcomes are likely to apply more widely. Because of the fact that the research design of this study a case study design is, the outcomes cannot be generalised. Nevertheless, Verschuren and Doorewaard (2010) claim that a larger sample size increases the external validity and also gives the researcher possibilities to make general statements. In this case study, the researcher features a large sample size (around 550 employees), so in this research the external validity is acceptable.

To make the reliability and the validity of this research outcomes greater, triangulation of methods and triangulation of sources are implemented during conducting this research.

4. Results

This chapter describes the results of the empirical study. Firstly, the responses on the observations and survey questionnaire are stated. Secondly, the effects of the nudging interventions are pointed out. Thirdly, the experiences regarding the nudging interventions are described.

4.1 Response

Observations

In total there have been 14,357 observation moments in the observation period, consisting of five weeks. The minimum amount of observations on one day was 655, the maximum amount of observations was 1,178.

In the baseline week, 67.11% of the employees used the stairs and 32.89% used the elevator (standard deviation (SD): 7.3990). In the first nudging intervention week, 68.65% of the employees used the stairs and 31.35% used the elevator (SD: 0,1572). In the first control week, 67.47% of the employees used the stairs and 32.53% used the elevator (SD: 2.2434). In the second nudging intervention week, 71.14% of the employees used the stairs and 28.86% used the elevator (SD: 2.0906). In the second control week, 65.38% of the employees used the stairs and 34.62% used the elevator (SD: 2.0406).

In appendix C two overviews regarding the obtained data per day and per week are shown. From the overview with the observation data per week, it can be seen that in the two nudging intervention weeks the average stair use percent has slightly increased compared to the previous week. In paragraph 4.2 the effects of the nudging interventions will be analysed.

Beside the high amount of observation moments, the researcher also got some responses from the employees during conducting the observations, see table 4.

<p>Week 1 Baseline week</p>	<ul style="list-style-type: none"> • "Now I see you, I have to take the stairs of course." • "What are you doing? Will the elevators be removed?" • "She is observing and counting us, so we have to take the stairs." • "This is the twentieth time that I take the stairs today. Did you notice it?" • "Do you work out enough as well?"
<p>Week 2 First nudging intervention (Poster)</p>	<ul style="list-style-type: none"> • [Reading poster] "Free work out during working hours? Hell no." • "Oh, now I get what you are doing." • [Conversation between colleagues] "Shall we take the elevator to the fifth floor?" "Yes, but do we get no punishment? Or a comment?" • "Aah, did you put the posters next to elevator? Is it a nudge?" • "What do you count today? I have sat outside, does that count as well?" • [Conversation between colleagues] "Just ignore the poster" "Yes, I find the floor where I have to be a little bit too far." • [Colleague to another colleague] "You normally take the elevator, right?" • [Colleague to another colleague] "Shall I help you with opening the door?" • "Using the stairs for going down is fine, but for going up it is not."
<p>Week 3 First control week</p>	<ul style="list-style-type: none"> • "Eventually, it makes sense that you sit here. I was inclined to take the elevator, but then I saw you and that was the moment that I thought 'I cannot do this', so that is why I choose for the stairs right now." • "Aah, did you remove the posters? That will be the test of course."

	<ul style="list-style-type: none"> “How many days will you be here? I work also with data and after three days observing, you can already know what the differences are between the days. So you do not have to sit here that much.”
Week 4 Second nudging intervention (Footprints)	<ul style="list-style-type: none"> “Well, you are dedicated.” “Well, does this mean that we do not doing it well?” “These footprints are yours? Genius!” “You can also put a sign next to the elevator: ‘Out of Order’.” “Did you place these footprints?” [Thumps up and takes the elevator] “Now I feel bad to take the elevator while seeing these footprints.”
Week 5 Second control week	<ul style="list-style-type: none"> “Aah, the footprints are removed.” “Now when the footprints are removed, I will take the elevator.” “Oh, the footprints are gone, I do miss them.” “We will take the elevators, because you are still sitting over here.” “Well, we would not be counted anymore, we can use the elevator. Quick!”

Table 4: Responses of employees on researcher and nudging interventions.

Survey questionnaire

The link of the online survey questionnaire was spread on the last observation day in the second control week. The research units were able to fill in the online survey questionnaire from the last observation day in the second control week to a week afterwards. The total respondent population of the survey questionnaire was 255. The survey questionnaire is completed by 254 persons ($\approx 46.18\%$), one respondent did not answer all the questions.

4.2 Effects nudging interventions

Observations

The aim of the observations was to find out the effectiveness of the nudging interventions on the stair use of the headquarters users from the case organisation. For finding out the effectiveness of the nudging interventions, it was important to compare the weekly obtained data with each other. Figure 6 shows that the weekly stair use has slightly increased from week 1 (67.11%) to week 2 (68.65%), more or less decreased in week 3 (67.47%), to some degree increased in week 4 (71.14%) and slightly decreased in week 5 (65.38%). This figure 6 shows that after implementing the nudging interventions the stair use increased and after removing the nudging interventions the stair use decreased.

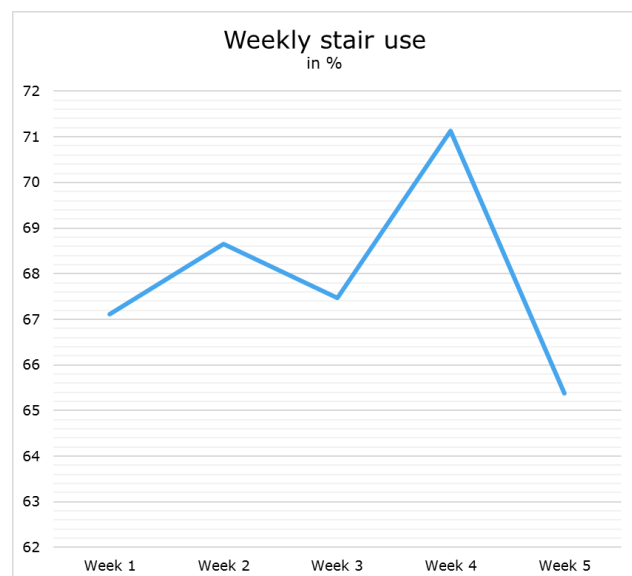


Figure 6: Weekly stair use in percentages.

On the next page, table 5 shows this as well. When the nudging intervention weeks are compared to the previous week, it becomes clear that the percentage of change has increased. When all weeks are compared to the baseline week, table 5 shows that there has been a positive change in week 2, 3 and 4. When we compare week 5 with the baseline week, table 5 presents a negative change, which is not significant (see table 6).

Week	Nudging intervention	Average Stair use %	% Change compared to previous week	% Change compared to baseline week
1	None (baseline)	67.11	0.00	0.00
2	Poster	68.65	+ 1.54	+ 1.54
3	None (control 1)	67.47	- 1.18	+ 0.36
4	Footprints	71.14	+ 3.67	+ 4.03
5	None (control 2)	65.38	-5.76	- 1.73

Table 5: Average Stair use in percentages and the change compared to the previous week and baseline week in percentages.

A paired samples t-test was run, in order to test if there were significant differences in stair use between week 1 (baseline) and 2 (first intervention), week 2 and 3 (first control week), week 3 and 4 (second intervention), week 4 and 5 (second control week), week 1 and 5 (the 'lasting' effect of the nudging interventions), week 1 and 4 and week 2 and 4. See also figure 5 (Chapter 3).

In this research the researcher presumes that the nudging intervention has a positive direct effect on the stair use. So, the presumed relationship between the concepts is (see also paragraph 2.4): in case a nudging intervention is being implemented, the stair use will increase. Therefore, the paired samples t-test in this research is an one-tailed test, with a p-value divided by two.

In this research the difference in stair use between week X and Y is significant if the p-value is smaller than 0.15 ($p < 0.15$). A p-value of 0.15 means that the observed difference can be attributed to chance by 15%. The researcher accepts p-values below 0.15 as significant and accepts possible uncertainty.

In appendix C the outputs of the paired samples t-test are shown. Table 6 briefly shows the outputs of the test. The stair use change between the following weeks is not significant: week 1 and 2 ($p = 0.3775$), week 2 and 3 ($p = 0.2155$), week 1 and 5 ($p = 0.3905$) and week 1 and 4 ($p = 0.2345$).

The stair use change between week 3 and 4 ($p = 0.1345$), week 4 and 5 ($p = 0.0305$) and week 2 and 4 ($p = 0.095$) are significant, with a p-value smaller than 0.15.

Week	p	Significant with $p < 0.15$?
1 & 2	$0.755/2 = 0.3775$	No
2 & 3	$0.431/2 = 0.2155$	No
3 & 4	$0.269/2 = 0.1345$	Yes
4 & 5	$0.061/2 = 0.0305$	Yes
1 & 5	$0.781/2 = 0.3905$	No
1 & 4	$0.469/2 = 0.2345$	No
2 & 4	$0.190/2 = 0.095$	Yes

Table 6: Brief overview of the outputs of the paired samples t-test.

Survey questionnaire

In the survey questionnaire four statements were about the effects of the nudging interventions. In the following sub paragraphs the output of each statement is described.

- Poster statement 1:

I have the feeling that the posters next to the elevators on the ground floor have positively influenced me up to now regarding choosing for the stairs instead of the elevator.

This statement is filled in by 118 respondents, because 118 respondents have seen the posters, see figure 11. In total 17.8% of the respondents agreed that the posters influenced them in a positive way up to now for choosing for the stairs. None of the respondents answered 'totally agree'. Almost half of the respondents (49.1%), who have seen the posters, did have a negative attitude towards the influence of the posters on them regarding choosing for the stairs. One third (33.1%) of the respondents answered neutrally, so they do not have the feeling that the posters influence them in a positive or negative way. These results are not in line with the expected results. The researcher expected that the posters would influence the employees in a positive way, but the majority of the employees (82.2%) showed different results.

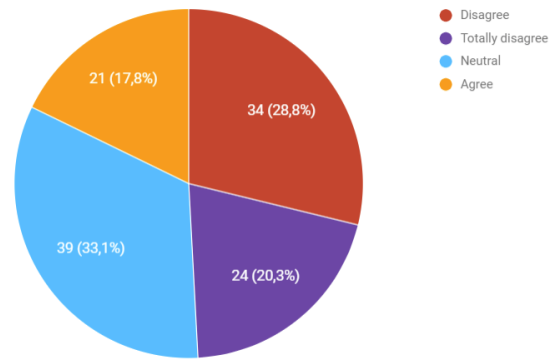


Figure 7: Results Poster statement 1

- Poster statement 2:

I have the feeling that the posters next to the elevators on the ground floor have positively influenced me regarding choosing for the stairs instead of the elevator in the future.

This statement is filled in by 118 respondents, who have seen the posters. The distribution of the given answers are similar to the given answers on the first poster statement. In total 21.2% of the respondents agreed that the poster influenced them in a positive way, so that they will choose for the stairs instead of the elevator in the future. None of the respondents answered 'totally agree'. In total 45.8% (26.3%+19.5%) do not feel that the posters have any influence on them for choosing for the stairs instead of the elevator in the future. The rest (33.1%) answered neutrally. This is the same percentage as at poster statement 1. And just like the results of poster statement 1, the expected results were different than the obtained results.

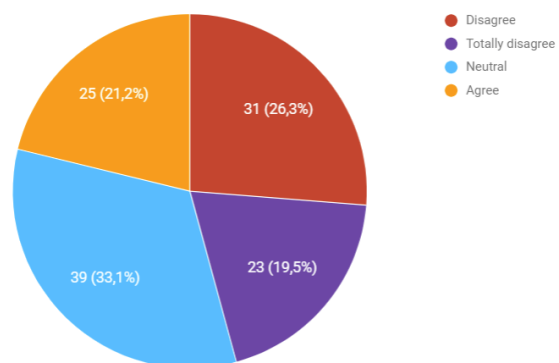


Figure 8: Results Poster statement 2

- Footprints statement 1:

I have the feeling that the yellow footprints on the ground floor have positively influenced me up to now regarding choosing for the stairs instead of the elevator.

This statement is filled in by 233 respondents, because 233 respondents have seen the footprints, see figure 14. In total 19.7% (16.3%+3.4%) of the respondents agreed that the footprints influenced them in a positive way up to now for choosing for the stairs. Almost half of the respondents (46.4%), who have seen the footprints, did have a negative attitude towards the 'up to now' influence of the footprints on them regarding choosing for the stairs. One third (33.9%) of the respondents answered neutrally, so they do not have the feeling that the footprints influenced them in a positive or negative way. These results are not in line with the expected results. The researcher expected that the footprints would influence the employees in a positive way, but the majority of the employees (80.3%) showed different results.

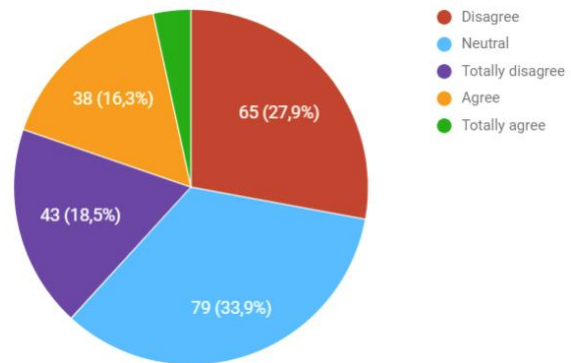


Figure 9: Results Footprints statement 1

- Footprints statement 2:

I have the feeling that the yellow footprints on the ground floor have positively influenced me regarding choosing for the stairs instead of the elevator in the future.

This statement is filled in by 233 respondents, who have seen the footprints. The distribution of the given answers are similar to the given answers on the first footprints statement. In total 18.1% (15.5%+2.6%) of the respondents have the feeling that the footprints have positively influenced them for choosing for the stairs in the future. In total 46.3% (28.3%+18.0%) of the respondents do not feel that the posters have any positive influence on them for choosing for the stairs instead of the elevator in the future. The rest (35.6%) answered neutrally, so they do not have the feeling that the footprints influenced them in a positive or negative way. And just like the results of footprints statement 1, the expected results were different than the obtained results.

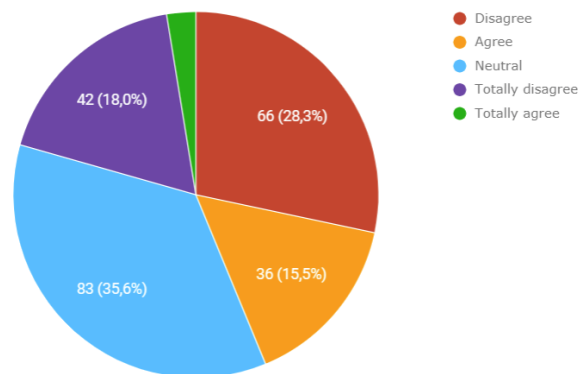


Figure 10: Results Footprints statement 2

4.3 Experiences nudging interventions

Survey questionnaire

The aim of the survey questionnaire was to find out the experiences of the employees regarding the nudging interventions. In the survey questionnaire five questions were about the experiences regarding the nudging interventions. In the following sub paragraphs the output regarding the experiences of each nudging intervention according to the respondents are described.

- Poster question 1:

Did you notice the posters next to the elevators on the ground floor?

This question is filled in by 255 respondents. 46.3% of the respondents have seen the posters, which were placed next to the elevators on the ground floor. At the same time, more than half of the employees who filled in the questionnaire did not see the posters (53.7%).

The obtained results are in line with the expected results, because the researcher expected that the persons who always took the stairs, did not see the posters. Or more accurately, these people were not able to see the posters. The posters were only put directly next to the elevators.

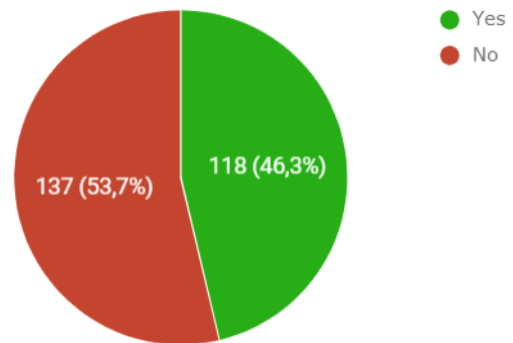


Figure 11: Results Poster visibility

- Poster question 2:

What do you think of these posters?

This question is filled in by 118 respondents, who have also seen the posters. At this question, respondents were able to choose between three positive answers, (nice, innovative, funny), three negative answers (annoying, weird, boring) and 'Otherwise...'. The researcher determined if these 'Otherwise...' answers belonged to the positive, negative or neutral answer categories. 83.1% of the respondents had a positive attitude towards the posters, while 9.3% had a negative attitude. Finally 7.6% of the respondents had a neutral attitude towards the poster.

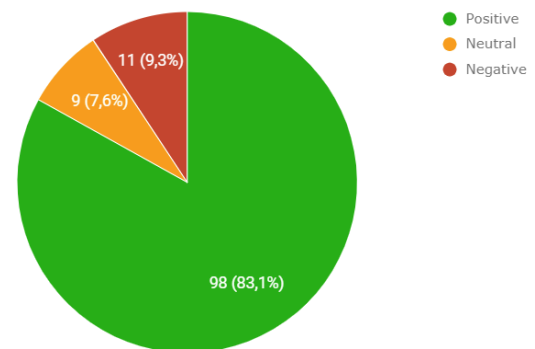


Figure 12: Results Poster opinions

- Poster question 3:

What was the message on the posters?

This question is filled in by 118 respondents, who have also seen the posters. In total 62.7% of the respondents knew what the text on the poster was. The message on the poster was: 'Free workout during work hours? Take the stairs.'. The other 37.3% did not know what was mentioned on the poster: more than 40% of these people did not have any idea (15.3%), and almost 60% (13.6%+1.7%+6.8%=22.1%) chose the wrong answer.

These results are not in line with the expected results. The researcher expected that more people would remember the message on the poster. The researcher was also surprised by the fact that almost 60% of the people who did not know the correct answer, guessed wrong.

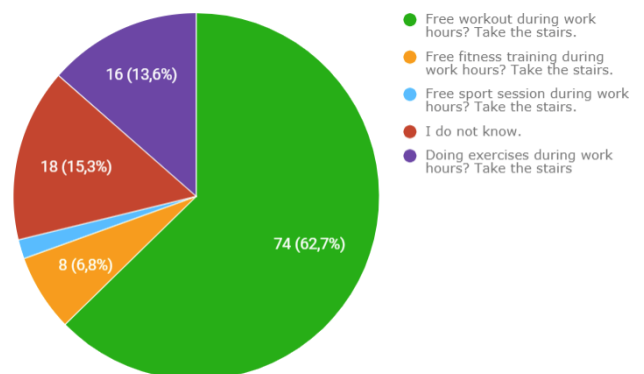


Figure 13: Results Poster message

- Footprints question 1:

Did you notice the yellow footprints on the ground floor?

This question is filled in by 254 respondents. 91.4% of the respondents have seen the footprints. At the same time, 8.2% of the respondents did not see the posters. One respondent did not fill in the question (0.4%). These results are in line with the expected results. The researcher took in mind the people who could be on holiday and therefore were not able to see the footprints. The fourth observation week was a week in which some Dutch people with little children take a few days off normally.

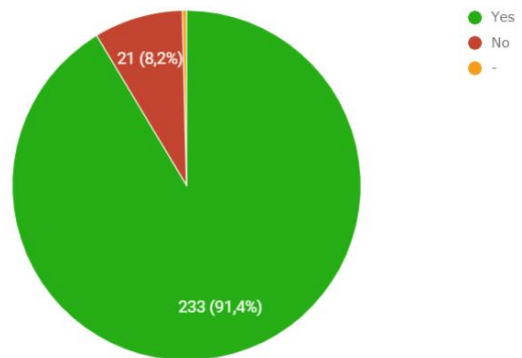


Figure 14: Results Footprints visibility

- Footprints question 2:

What do you think of the yellow footprints?

This question is filled in by 233 respondents, who have also seen the footprints. At this question, respondents were able to choose between three positive answers (nice, innovative, funny), three negative answers (annoying, weird, boring) and 'Otherwise...'. The researcher determined if these 'Otherwise...' answers belonged to the positive, negative or neutral answer categories. 81.5% of the respondents had a positive attitude towards the footprints, while 11.6% had a negative attitude. Finally 6.9% of the respondents had a neutral attitude towards the footprints.

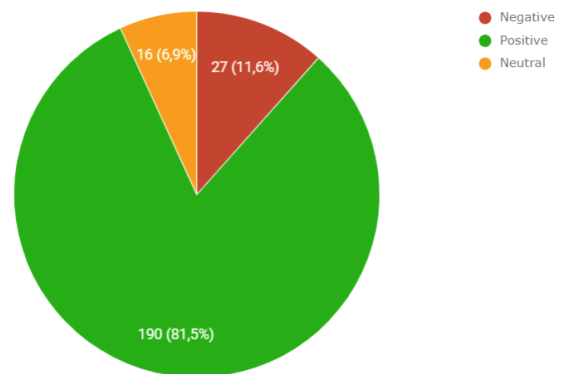


Figure 15: Results Footprints opinions

These obtained results are in line with the expected results. The researcher expected that the majority of the research units had a positive attitude towards the footprints, but also took in mind that there are always a few people who do not like any changes in the environment.

5. Conclusion and discussion

Due to the outcomes of the theoretical framework and the empirical study, the main question of this research: '*To what extent does a **nudging intervention** influence the **stair use** of employees in the **office environment**?*' is answered in the first paragraph of this chapter. In the second paragraph the discussion is stated. The limitations of this research are presented in the third paragraph. Finally, recommendations for further research are given.

5.1 Conclusion

The objective of this research was to find out if nudging interventions are effective to stimulate stair use of office users by investigating what influence nudging interventions could have on the stair use of employees in the office environment.

This research shows that footprints as a nudging intervention to increase stair use of employees in an office environment are significantly more effective than posters ($p=0.095$).

Posters were not effective in order to stimulate stair use of office users. Although after implementing the posters the stair use slightly increased (+1.54%). This change was not significant. After removing the posters the stair use decreased again, however, this decrease was not significant.

The majority of the respondents who filled in the survey questionnaire indicated not to have the feeling that the posters had positively influenced them for choosing for the stairs instead of the elevator up to now (82.2%) or in the future (78.9%). However, a majority (83.1%) had a positive attitude towards the posters and found them nice, innovative and/or funny, but 37.3% of the employees, who had seen the posters, did not know the message on the posters.

On the other hand, the nudging intervention using footprints was effective in order to stimulate stair use. After implementing the footprints the stair use significantly ($p=0.1345$) increased (+3.67%). After removing the footprints the stair use significantly ($p=0.0305$) decreased (-5.76%) again.

However, the majority of the respondents who filled in the survey questionnaire indicated that the footprint nudges could not influence them for choosing the stairs instead of the elevator up to now (80.3%) or in the future (81.9%). These respondents had a negative or neutral attitude towards the effectiveness of the footprints. Nevertheless, the majority (81.5%) perceived the yellow footprints as nice, innovative and/or funny, against 11.6% who did not like the footprints.

It is remarkable that the stair use over the five weeks decreased. In week 5, after the second nudging intervention was removed, the stair use decrease was -1.73% compared to the baseline week. Although this decrease was not significant ($p=0.3905$). The difference in outcomes can probably be explained by the fact that the standard deviation of the stair use in the baseline week was high (SD: 7.3990), compared with the standard deviation of the fifth week (SD: 2.0406). This means that the observed data points in the baseline week were more spread out over a wider range of values than the observed data points in the fifth week. The difference in standard deviations could be caused by unforeseen circumstances, such as company events and employees who were on holiday.

5.2 Discussion

Because of the fact that the researcher has used several research sources, studies and methods, the observations and survey questionnaire are conducted in an uniform way and that the sample size is large, the validity of this research is ensured. However, due to the fact that this research is a case study, the outcomes cannot be generalised.

The results of this study partly match with findings of previous studies. However, in this study, in contrast to earlier findings of studies in which posters with a health sign or message were used (Van Hoecke et al., 2018; Vanden Auweele et al., 2005), the posters did not show significant results. The difference in outcomes can possibly be explained by the fact that the baseline stair use rates were higher in this case study than in some comparable studies. In case rates are already high, it is more difficult to show change (Andersen et al., 2012).

In this study, the results regarding the footprints are similar to one of the two previous studies in which footprints were used (Van Hoecke et al., 2018). In this study the stair use increased from 27.7% at baseline to 31.2% (+3.5%), whereas in this study the stair use increased from 67.11% at baseline to 71.14% (+4.03%) in the fourth observation week. In comparison to the previous week (the third observation week) the stair use increased with 3.67%. A possible explanation for this similar result could be that the footprints were immediately visible on the floor in comparison to the posters, which were put next to the elevator. The posters could only be noticed by elevator users or the employees who passed the elevators while walking to the restaurant for example. Research units who immediately went to the stairs, could not or barely see the posters from such a distance. In contrast to the posters, the footprints were visible for the research units and were placed at the spot where the individuals had to make the binomial choice: using the stairs or the elevator. From three different locations the footprints were visible and led the research units in the right direction to the stairs (e.g. employees who came into the office and employees who left the restaurant). The footprints were placed 'in the face'. It was hard to ignore the footprints, which is also showed in the outcomes of the survey questionnaire: 91.4% (233 respondents) have seen the footprints, against only 46.3% (118 respondents) who have seen the posters.

Another possible explanation could be the differences in appearance of the nudging interventions. The posters include, beside an image also text, and were also printed in green and white colours on A4 paper size. This could have been any sign with any message, in an office building where quite a lot posters are being used (see appendix B). This may possibly lead to a disinterest in posters in general. The footprints were just simple yellow footprints of 20 cm long and did not include text or something like that. The bright yellow footprints were put on the black tile floor and could therefore impossibly be ignored.

The researcher also observed that not many employees who were waiting for the elevator, took the time for or were interested in reading the poster. This was in contrast to the easy visible footprints, where even several employees hopped on the footprints and made a game of it, just like when they were kids. Vestergaard Andersen (2014) found that in case nudging interventions were perceived as fun, engaging and incorporated creative visuals instead of text, people have had more positive associations and feelings than nudging interventions without these three characteristics. So, the effectiveness of the footprints is in all likelihood declared by the fact that the footprints were perceived as funny (gamification) and were more clearly visible, eye-catching and creative than the posters.

This study is complementary to the existing literature about nudging interventions in an office environment in order to increase stair use, because previous studies have shown different outcomes regarding the effectiveness of nudging interventions. Therefore it was not conclusive yet what the influence of nudging interventions is on stair use. Because of the fact that this study shows outcomes which are in line with the existing literature, but also shows outcomes which are not consistent with the existing literature, further research regarding the effectiveness of nudging interventions in an office environment to stimulate stair use is recommended. In paragraph 5.4 other recommendations for further research are presented.

5.3 Limitations

During conducting this research, various limitations showed up that could have influenced the results and conclusion of this research. The limitations are described in the following sub paragraphs.

Firstly, the presence of the researcher as observer could have highly influenced the results of this study. For the observations it was necessary to have a direct view on the stairs and elevators. Due to this, it was not possible for the researcher to do the observations at an inconspicuous location. Sitting at an outstanding location could have led to socially desirable behaviour. The researcher got also some comments of the research units during the observations, like 'Because now you are sitting here, I will take the stairs instead of the elevator, which I normally do.' Another thing which could also have influenced the choice was experienced group pressure, in case observed research units walked in groups.

Secondly, the research population and the amount of observations could have influenced the results of this study. The researcher could not take care of that only the same group of participants had been observed in the observation period. Also during the observations the participants could be counted more than once or not even once at one observation day, because they could work at the ground floor and did not need to go up during the observation days for example. Other examples of reasons not being observed could be a workday at home, holidays or meetings at other offices. Beside this, the researcher was also not able to observe to which floor research units would go. So, the researcher could not find out if the nudging interventions only applied to and influenced participants who had to go to the first (few) floors or also to participants who had to go to higher floors.

Thirdly, the (order of) time of the implementation of the nudging interventions could have influenced the results. At the time that the footprints were implemented, the research units already knew for three weeks that they were being observed. At the time that the footprints were implemented, several questions about the footprints were asked by the employees (see table 4). Even in some cases the link between the posters and the footprints was made.

Fourthly, the survey questionnaire could be filled in by respondents with socially desired answers, which could have influenced the results. This could also be seen at the output of the survey questionnaire question: 'What was the message on the poster?'. In total 37.3% of the respondents did not know what was mentioned on the poster, and almost 60% of this group chose the wrong answer instead of 'I do not know'. These people took the chance of guessing the right answer, instead of being honest and choosing for the answer 'I do not know'.

Fifthly, because of the fact that the research design of this study a case study design is and the setting was characterised by a particular design and population, the outcomes probably cannot be generalised. Nevertheless, Verschuren and Doorewaard (2010) claim that a larger sample size increases the external validity and also gives the researcher possibilities to make general statements. In this case study, the researcher features a large sample size (around 550 employees), so in this research the external validity is acceptable, but the generalisability is doubtful.

5.4 Further research

During conducting this research, various possibilities for further research showed up. One recommendation is already stated in paragraph 5.2. The other most relevant possibilities for further research are described in the following paragraph.

Firstly, it is recommended to use cameras instead of conducting observations in future research. The researcher of this study has the strong feeling that the results are highly influenced by the presence of the observer. With the help of cameras, the research units could be observed from a distance. This could lead to less socially desired behaviour and less influenced results.

Secondly, for further studies it might be more reliable when the observation weeks are extended. In this research the observation period existed of five weeks, in which every week had its own 'specialty' (baseline, nudge 1 or 2, etc.). It is recommended to extend the overall observation period in further research to get more reliable data. In this research some people were excluded because of the fact that they were on holiday for example.

Thirdly, another interesting topic for further studies is the differences in effectiveness between creative nudging interventions and more 'traditional' nudges (flyers and posters) regarding encouraging stair use. In case it turns out that creative nudging interventions are more effective than traditional ones, this could mean that the effectiveness of nudging interventions regarding stair use can be conclusive and that more creative nudges will be developed.

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Appendices

Appendix A: Map ground floor

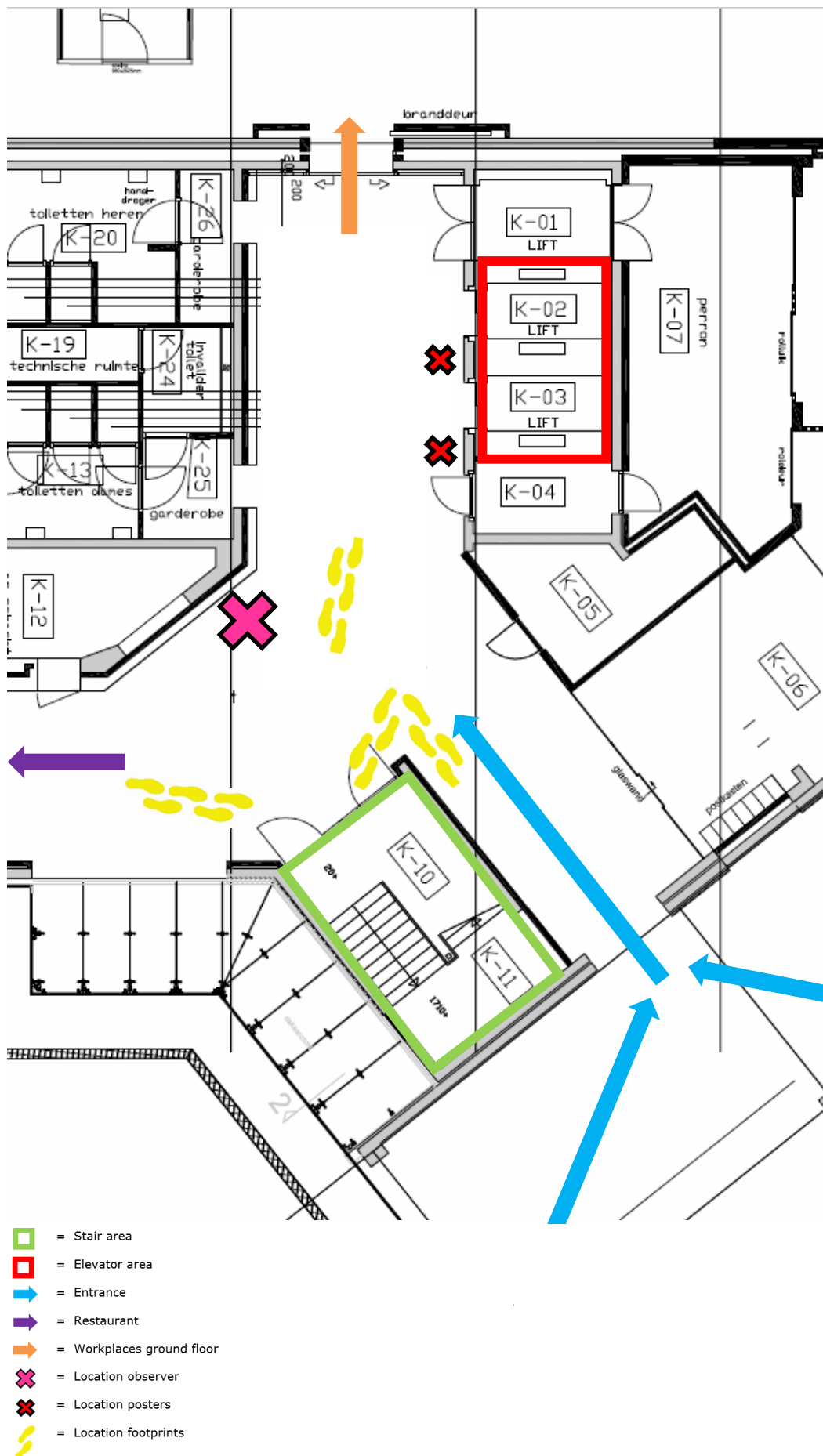
Appendix B: Photos observation location and nudging interventions

Appendix C: Observation analysis

Appendix D: Survey questionnaire

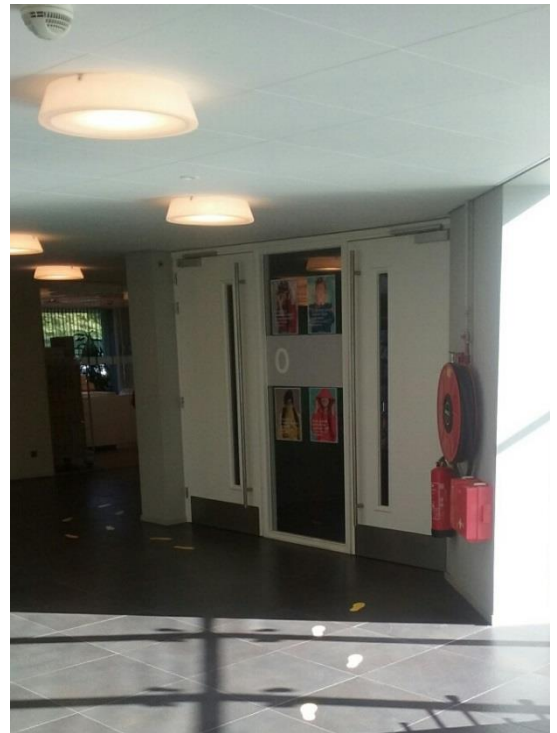
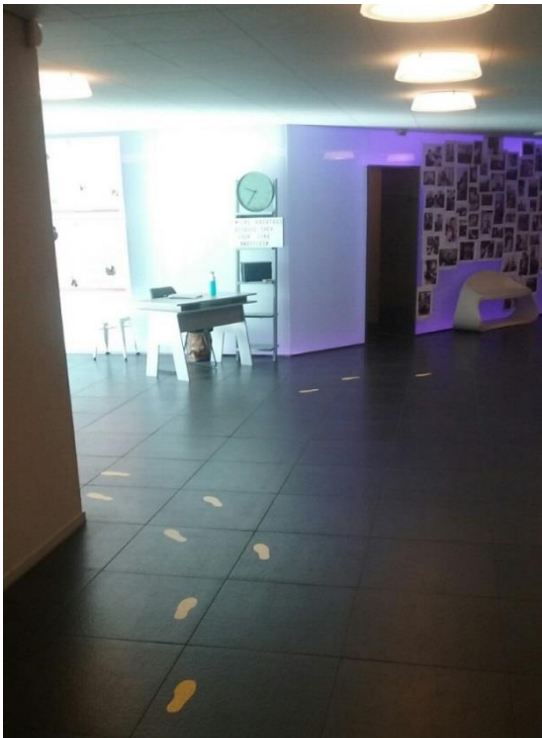
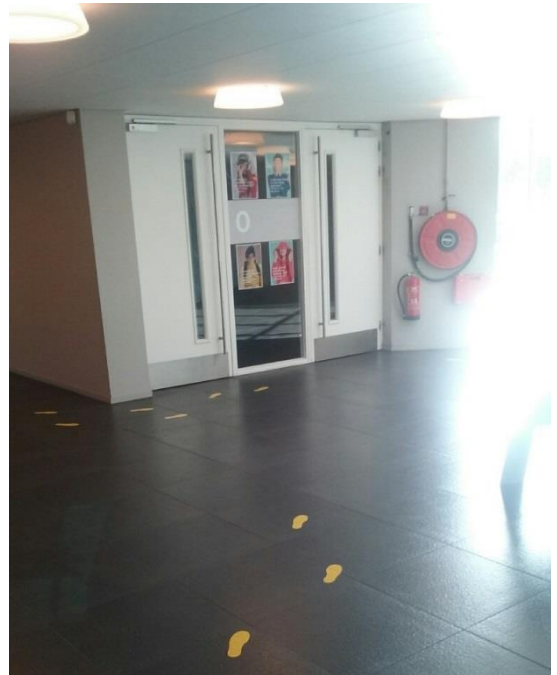
Appendix E: Small note

Appendix A: Map ground floor



Appendix B: Photos observation location and nudging interventions





Appendix C: Observation analysis

Firstly, two overviews of the observation data are shown. Secondly, the outputs of the one-way paired samples t-test are given.

Overview observation data per day

Week	Date (dd/mm/yy)	Nudging intervention	Elevator use	Elevator use %	Stair use	Stair use %	Total	Total Percent
1	9/4/18	None (baseline)	269	41.07	386	58.93	655	100.0
	10/4/18	None (baseline)	314	26.66	864	73.34	1178	100.0
	12/4/18	None (baseline)	277	30.95	618	69.05	895	100.0
2	16/4/18	Poster	304	31.21	670	68.79	974	100.0
	17/4/18	Poster	332	31.32	728	68.68	1060	100.0
	19/4/18	Poster	370	31.52	804	68.48	1174	100.0
3	23/4/18	None (control 1)	299	30.86	670	69.14	969	100.0
	24/4/18	None (control 1)	338	31.65	730	68.35	1068	100.0
	26/4/18	None (control 1)	308	35.08	570	64.92	878	100.0
4	30/4/18	Footprints	244	29.33	588	70.67	832	100.0
	1/5/18	Footprints	288	30.67	651	69.33	939	100.0
	3/5/18	Footprints	246	26.57	680	73.43	926	100.0
5	7/5/18	None (control 2)	326	32.47	678	67.53	1004	100.0
	8/5/18	None (control 2)	389	36.53	676	63.47	1065	100.0
	9/5/18	None (control 2)	258	34.86	482	65.14	740	100.0
Total			4562	32.05	9795	67.95	14,357	100.0

Overview observation data per week

Week	Nudging intervention	Average Elevator use %	Std. deviation Elevator use	Average Stair use %	Std. deviation Stair use	Total %
1	None (baseline)	32.89	7.3990	67.11	7.3990	100.0
2	Poster	31.35	0.1572	68.65	0.1572	100.0
3	None (control 1)	32.53	2.2434	67.47	2.2434	100.0
4	Footprints	28.86	2.0906	71.14	2.0906	100.0
5	None (control 2)	34.62	2.0406	65.38	2.0406	100.0
Total		32.05	3.6973	67.95	3.6973	100.0

Stair use change between baseline week and week first nudge (1 & 2)

Is there a significant difference in stair use between the baseline week and the week in which the first nudge (poster) had been implemented?

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Week1	67.1067	3	7.39895	4.27178
Week2	68.6500	3	.15716	.09074

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Week1 - Week2	-1.54333	7.48714	4.32270	-20.14241	17.05575	-.357	2	.755

Stair use change between week first nudge and first control week (2 & 3)

Is there a significant difference in stair use between the week in which the first nudge (poster) had been implemented and the first control week?

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Week2	68.6500	3	.15716	.09074
Week3	67.4700	3	2.24341	1.29523

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Week2 - Week3	1.18000	2.08899	1.20608	-4.00935	6.36935	.978	2	.431

Stair use change between first control week and week second nudge (3 & 4)

Is there a significant difference in stair use between the first control week and the week in which the second nudge (footprints) had been implemented?

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Week3	67.4700	3	2.24341	1.29523
Week4	71.1433	3	2.09058	1.20700

Paired Samples Test

	Paired Differences					t	df	Sig. (2-tailed)
	Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1 Week3 - Week4	-3.67333	4.19769	2.42354	-14.10098	6.75432	-1.516	2	.269

Stair use change between week second nudge and second control week (4 & 5)

Is there a significant difference in stair use between the week in which the second nudge (footprints) had been implemented and the second control week?

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Week4	71.1433	3	2.09058	1.20700
Week5	65.3800	3	2.04061	1.17815

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Week4 - Week5	5.76333	2.57636	1.48746	-6.3670	12.16337	3.875	2	.061

Stair use change between baseline week and second control week (1 & 5)

Is there a significant difference in stair use between the baseline week and the second control week?

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Week1	67.1067	3	7.39895	4.27178
Week5	65.3800	3	2.04061	1.17815

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Week1 - Week5	1.72667	9.42658	5.44244	-21.69026	25.14359	.317	2	.781

Stair use change between baseline week and week second nudge (1 & 4)

Is there a significant difference in stair use between the baseline week and the week in which the second nudge (footprints) had been implemented?

Paired Samples Statistics

	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 Week1	67.1067	3	7.39895	4.27178
Week4	71.1433	3	2.09058	1.20700

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	Week1 - Week4	-4.03667	7.88061	4.54987	-23.61319	15.53986	-.887	2	.469

Stair use change between week first nudge and week second nudge (2 & 4)

Is there a significant difference in stair use between the week in which the first nudge (poster) had been implemented and the week in which the second nudge (footprints) had been implemented?

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Week2	68.6500	3	.15716	.09074
	Week4	71.1433	3	2.09058	1.20700

Paired Samples Test

		Paired Differences				t	df	Sig. (2-tailed)	
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower				Upper
Pair 1	Week2 - Week4	-2.49333	2.21464	1.27862	-7.99481	3.00814	-1.950	2	.190



Appendix D: Survey questionnaire

Dutch	English
<p>Beste collega's,</p> <p>Zoals jullie gemerkt hebben, ben ik vorige maand gestart met het verzamelen van data voor mijn Masterscriptie-onderzoek bij de Wageningen Universiteit. Het onderzoek gaat over 'Trapgebruik in kantooromgevingen', met als case-organisatie X. Met behulp van deze enquête wordt onderzocht wat jullie ervaringen zijn met betrekking tot de twee nudging interventies. Deze twee interventies zijn de afgelopen paar weken toegepast.</p> <p>Het invullen van de vragenlijst duurt slechts 3 minuten. De antwoorden op de vragen worden volledig anoniem en strikt vertrouwelijk behandeld. U wordt verzocht om de vragen zo goed als mogelijk naar waarheid in te vullen en op uw eerste ingeving af te gaan. Indien u vragen of opmerkingen heeft over de enquête, dan kunt u contact opnemen met de onderzoeker Iris van der Meiden (e-mailadres).</p> <p>Alvast hartelijk bedankt voor het invullen van de vragenlijst!</p>	<p>Dear colleagues,</p> <p>As you have already noticed, I began with collecting data for my Master thesis at the Wageningen University. The research is about 'Stair use in office environments', with X as case organisation. With the help of this survey questionnaire your experiences regarding the two nudging interventions studied. These two nudging interventions were implemented the last weeks.</p> <p>It will only take 3 minutes of your time to fill in the survey questionnaire. The answers on the questions will be treated confidentially and anonymously. You are asked to fill in the questions truthfully as good as possible and to rely on your intuition. In case you have any questions or remarks, you can contact the researcher Iris van der Meiden (email address).</p> <p>Thank you in advance for filling in the survey questionnaire!</p>
<p>1) Persoonlijke gegevens</p> <p>Wat is uw geslacht?</p> <ul style="list-style-type: none"> <input type="radio"/> Man <input type="radio"/> Vrouw <p>Wat is uw leeftijd?</p> <p>.....</p> <p>Wat is uw hoogst genoten opleiding?</p> <ul style="list-style-type: none"> <input type="radio"/> Basis/voortgezet onderwijs <input type="radio"/> MBO <input type="radio"/> HBO <input type="radio"/> WO <input type="radio"/> Anders... <p>Op welke verdieping bent u het meest werkzaam?</p> <ul style="list-style-type: none"> <input type="radio"/> Begane grond <input type="radio"/> Eerste verdieping <input type="radio"/> Tweede verdieping <input type="radio"/> Derde verdieping <input type="radio"/> Vierde verdieping <input type="radio"/> Vijfde verdieping 	<p>1) Personal details</p> <p>What is your gender?</p> <ul style="list-style-type: none"> <input type="radio"/> Male <input type="radio"/> Female <p>What is your age?</p> <p>.....</p> <p>What is your highest education level?</p> <ul style="list-style-type: none"> <input type="radio"/> Primary/secondary education <input type="radio"/> Secondary vocational education <input type="radio"/> Higher professional education <input type="radio"/> Academic education <input type="radio"/> Otherwise... <p>At which floor do you work the most?</p> <ul style="list-style-type: none"> <input type="radio"/> Ground floor <input type="radio"/> First floor <input type="radio"/> Second floor <input type="radio"/> Third floor <input type="radio"/> Fourth floor <input type="radio"/> Fifth floor
<p>2) Trapgebruik</p> <p>Hoe vaak gebruikt u de trap gemiddeld per dag om naar een hoger gelegen verdieping te gaan?</p> <ul style="list-style-type: none"> <input type="radio"/> 0 keer, omdat ik niet naar een hoger gelegen verdieping hoef <input type="radio"/> 0 keer, omdat ik altijd de lift neem <input type="radio"/> 1 tot 2 keer <input type="radio"/> 3 tot 4 keer <input type="radio"/> 5 keer of meer 	<p>2) Stair use</p> <p>How often do you use the stairs on average per day to go up to a higher located floor?</p> <ul style="list-style-type: none"> <input type="radio"/> 0 times, because I do not need to go up to a higher located floor <input type="radio"/> 0 times, because I always take the elevator <input type="radio"/> 1 to 2 times <input type="radio"/> 3 to 4 times <input type="radio"/> 5 times or more

<p>Als ik op een lagere verdieping zou werken, dan zou ik vaker de trap vanaf de begane grond gebruiken om naar mijn werkplek te gaan.</p> <ul style="list-style-type: none"> <input type="radio"/> Zeer mee oneens <input type="radio"/> Mee oneens <input type="radio"/> Neutraal <input type="radio"/> Mee eens <input type="radio"/> Zeer mee eens 	<p>If I would work on a lower located floor, then I would use the stairs from the ground floor more often to go to my workplace.</p> <ul style="list-style-type: none"> <input type="radio"/> Totally disagree <input type="radio"/> Disagree <input type="radio"/> Neutral <input type="radio"/> Agree <input type="radio"/> Totally agree
<p>3) Nudging interventie 1</p> <p>Zijn de posters die geplaatst zijn bij de liften op de begane grond u opgevallen?</p> <ul style="list-style-type: none"> <input type="radio"/> Ja <input type="radio"/> Nee <input type="radio"/> Anders... <p>Wat vindt u van de posters die geplaatst zijn bij de liften op de begane grond? Meerdere antwoorden zijn mogelijk.</p> <ul style="list-style-type: none"> ❖ Leuk ❖ Vervelend ❖ Vernieuwend ❖ Raar ❖ Grappig ❖ Saai ❖ Anders... <p>Wat was de boodschap die op de posters stond?</p> <ul style="list-style-type: none"> <input type="radio"/> Gratis fitnessstraining tijdens werktijd? Neem de trap. <input type="radio"/> Bewegen tijdens werktijd? Neem de trap. <input type="radio"/> Gratis workout tijdens werktijd? Neem de trap. <input type="radio"/> Gratis sportsessie tijdens werktijd? Neem de trap. <input type="radio"/> Ik weet het niet. <p>Ik heb het gevoel dat de posters bij de liften op de begane grond mij <u>tot nu toe</u> positief hebben beïnvloed om voor de trap in plaats van de lift te kiezen.</p> <ul style="list-style-type: none"> <input type="radio"/> Zeer mee oneens <input type="radio"/> Mee oneens <input type="radio"/> Neutraal <input type="radio"/> Mee eens <input type="radio"/> Zeer mee eens <p>Ik heb het gevoel dat de posters bij de liften op de begane grond mij bewust hebben gemaakt om <u>in de toekomst</u> vaker voor de trap in plaats van de lift te kiezen.</p> <ul style="list-style-type: none"> <input type="radio"/> Zeer mee oneens <input type="radio"/> Mee oneens <input type="radio"/> Neutraal <input type="radio"/> Mee eens <input type="radio"/> Zeer mee eens 	<p>3) Nudging intervention 1</p> <p>Did you notice the posters next to the elevators on the ground floor?</p> <ul style="list-style-type: none"> <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Otherwise... <p>What do you think of the posters which were placed next to elevators on the ground floor? Multiple answers are possible.</p> <ul style="list-style-type: none"> ❖ Nice ❖ Annoying ❖ Innovative ❖ Weird ❖ Funny ❖ Boring ❖ Otherwise... <p>What was the message on the posters?</p> <ul style="list-style-type: none"> <input type="radio"/> Free fitness training during work hours? Take the stairs. <input type="radio"/> Doing exercises during work hours? Take the stairs. <input type="radio"/> Free workout during work hours? Take the stairs. <input type="radio"/> Free sport session during work hours? Take the stairs. <input type="radio"/> I do not know. <p>I have the feeling that the posters next to the elevators on the ground floor have positively influenced me <u>up to now</u> regarding choosing for the stairs instead of the elevator.</p> <ul style="list-style-type: none"> <input type="radio"/> Totally disagree <input type="radio"/> Disagree <input type="radio"/> Neutral <input type="radio"/> Agree <input type="radio"/> Totally agree <p>I have the feeling that the posters next to the elevators on the ground floor have positively influenced me regarding choosing for the stairs instead of the elevator <u>in the future</u>.</p> <ul style="list-style-type: none"> <input type="radio"/> Totally disagree <input type="radio"/> Disagree <input type="radio"/> Neutral <input type="radio"/> Agree <input type="radio"/> Totally agree

<p>4) Nudging interventie 2</p> <p>Zijn de gele voetstappen op de vloer van de begane grond u opgevallen?</p> <ul style="list-style-type: none"> <input type="radio"/> Ja <input type="radio"/> Nee <input type="radio"/> Anders... <p>Wat vindt u van de gele voetstappen op de vloer? Meerdere antwoorden zijn mogelijk.</p> <ul style="list-style-type: none"> ❖ Leuk ❖ Vervelend ❖ Vernieuwend ❖ Raar ❖ Grappig ❖ Saai ❖ Anders... <p>Ik heb het gevoel dat de gele voetstappen op de vloer mij <u>tot nu toe</u> positief hebben beïnvloed om voor de trap in plaats van de lift te kiezen.</p> <ul style="list-style-type: none"> <input type="radio"/> Zeer mee oneens <input type="radio"/> Mee oneens <input type="radio"/> Neutraal <input type="radio"/> Mee eens <input type="radio"/> Zeer mee eens <p>Ik heb het gevoel dat de gele voetstappen op de vloer mij bewust hebben gemaakt om <u>in de toekomst</u> vaker voor de trap in plaats van de lift te kiezen.</p> <ul style="list-style-type: none"> <input type="radio"/> Zeer mee oneens <input type="radio"/> Mee oneens <input type="radio"/> Neutraal <input type="radio"/> Mee eens <input type="radio"/> Zeer mee eens 	<p>4) Nudging intervention 2</p> <p>Did you notice the yellow footprints on the ground floor?</p> <ul style="list-style-type: none"> <input type="radio"/> Yes <input type="radio"/> No <input type="radio"/> Otherwise... <p>What do you think of the yellow footprints? Multiple answers are possible.</p> <ul style="list-style-type: none"> ❖ Nice ❖ Annoying ❖ Innovative ❖ Weird ❖ Funny ❖ Boring ❖ Otherwise... <p>I have the feeling that the yellow footprints on the ground floor have positively influenced me <u>up to now</u> regarding choosing for the stairs instead of the elevator.</p> <ul style="list-style-type: none"> <input type="radio"/> Totally disagree <input type="radio"/> Disagree <input type="radio"/> Neutral <input type="radio"/> Agree <input type="radio"/> Totally agree <p>I have the feeling that the yellow footprints on the ground floor have positively influenced me regarding choosing for the stairs instead of the elevator <u>in the future</u>.</p> <ul style="list-style-type: none"> <input type="radio"/> Totally disagree <input type="radio"/> Disagree <input type="radio"/> Neutral <input type="radio"/> Agree <input type="radio"/> Totally agree
<p>Uw reactie is opgeslagen en wordt volledig anoniem en strikt vertrouwelijk behandeld in het onderzoek 'Trapgebruik in kantooromgevingen'. Indien u vragen of opmerkingen heeft over de enquête, dan kunt u contact opnemen met de onderzoeker Iris van der Meiden (e-mailadres).</p> <p>Hartelijk bedankt voor het invullen van de vragenlijst!</p>	<p>Your answers have been saved and will be treated confidentially and anonymously in the study 'Stair use in office environments'. In case you have any questions or remarks, you can contact the researcher Iris van der Meiden (email address).</p> <p>Thank you for filling in the survey questionnaire!</p>

Appendix E: Small note

Dutch	English
 <p>Beste collega's,</p> <p>Zoals jullie gemerkt hebben, ben ik vorige maand gestart met het verzamelen van data voor mijn Masterscriptie-onderzoek bij de Wageningen Universiteit. Omdat ik bijna klaar ben met observeren, zou ik jullie willen vragen of jullie via deze link XXX mijn online vragenlijst zouden willen invullen. De link staat ook op het intranet.</p> <p>De antwoorden op de vragen worden volledig anoniem en strikt vertrouwelijk behandeld. Het invullen duurt maximaal 3 minuten.</p> <p>Alvast hartelijk bedankt en als je dit leest tijdens de lunchpauze, eet smakelijk!</p> <p>Groeten, Iris van der Meiden</p>	 <p>Dear colleagues,</p> <p>As you have already noticed, last month I began with collecting data for my Master thesis at the Wageningen University. Because of the fact I am almost done with observing, I would like to ask you if you would fill in my online survey questionnaire via this link XXX. The link is also mentioned on the internal website.</p> <p>The answers on the questions will be treated confidentially and anonymously. It will only take 3 minutes of your time to fill in the survey questionnaire.</p> <p>Thank you in advance for filling in the survey questionnaire and in case you are reading this during your lunch break, enjoy your lunch!</p> <p>Regards, Iris van der Meiden</p>