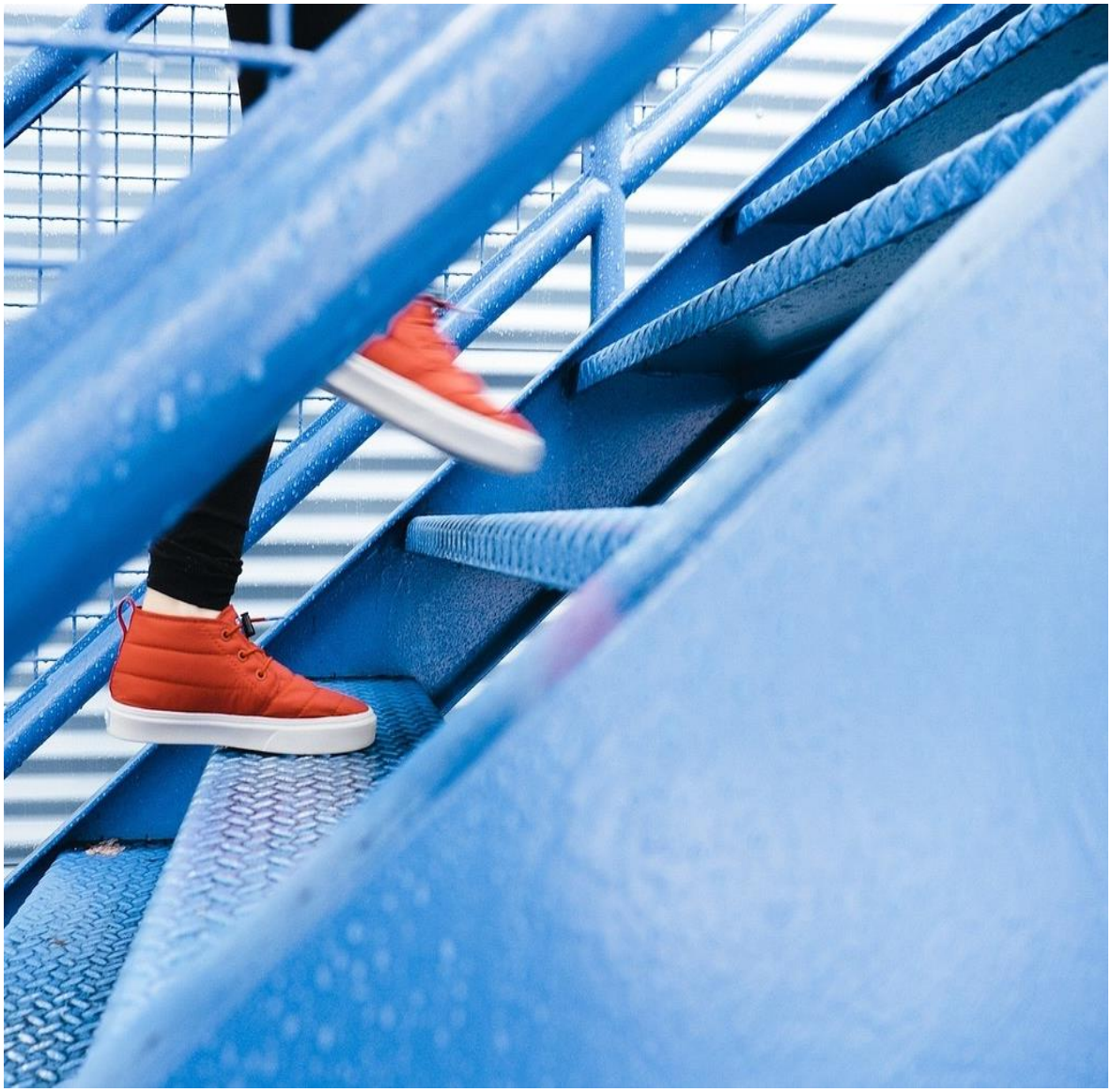

A LOCATION BASED COMMUNICATION INTERVENTION: STIMULATING THE USE OF STAIRS AT THE WORKPLACE THROUGH PROMPTS AND REDUCE STRESS

MSC THESIS
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"A Location Based Communication intervention:
stimulating the use of stairs at the workplace through prompts and reduce stress"

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Abstract

Aim: To investigate whether Location Based Communication (LBC)-app prompts in the workplace setting encourages employees' use of stairs, and if the prompts, and the possible increased use of stairs, could decrease the perceived stress level of employees.

Method: 17 Wageningen University & Research employees (29.4% males, 70.6 females, mean age = 42.8 (SD = 14.7)) were prompted with daily smartphone messages in a two-week intervention. The prompts contained content that stimulated the use of stairs. Three conditions were used: a normative- [EXP1], health message- [EXP2], and control condition [CONT3]. The use of stairs and perceived stress level were measured in a pre- and post-test online questionnaire. ANCOVA and simple regression analyses were conducted.

Results: Most important result is the limited to non-exposure to smartphone prompts of the participants, only 2 out of 17 participants received the prompts. Differences between pre- and post-test in number of flours willing to walk the stairs was not found to be significant in condition EXP1 (p =.92), EXP2 (p =.85), and CONT3 (p = .56). Also, no significant difference in all conditions was found between pre- and post-test in the frequency participants were currently walking up the stairs (EXP1 (p = .55), EXP2 (p =.83), and CONT3 (p = .39)) and walking down (EXP1 (p = .5.47, EXP2 (p = .62), and CONT3 (p = .39)). Differences between pre- and post-test in perceived stress level was not found to be significant in condition EXP1 (p = .89), EXP2 (p =.97), and CONT3 (p = .77). Formed hypotheses are rejected, since no prompts were received by the majority of the participants. Significant relation was not found in all conditions between; the prompts on the use of stairs, the use of stairs on the perceived stress level, the prompts on the perceived stress level, and the prompts on the perceived stress level with the use of stairs as a mediator. An additional check after the intervention on prompt exposure showed that no prompts were received when walking past the LBC.

Conclusion: No conclusions could be made on the effects of normative- and health message prompts on the use of stairs, because of the limited to non-exposure of participants to the content of the prompts. Receiving the prompts via the LBC-app and thereby creating exposure to the prompt content is very important. In future research, the effects of the prompt content received by the LBC-app, needs to be tested. Recommendations to comprehensively test the LBC-app before the research starts.

Keywords: Location-Based Communication, nudging, Workplace Health Promotion, use of stairs, physical activity

Preface

In front of you lies my MSc thesis, which was written in a six-month period from September 2018 to February 2019. This thesis is part of my master's program Communication, Health and Life Sciences at Wageningen University & Research at the chair group Strategic Communication. I hope that this thesis can give an insight in my experience with doing research on Location Based Communication (LBC), and can be of value to future studies that will use LBC.

I am amazed by how much I have learned about setting up a research, dealing with technology and adjusting along the way in the process of conducting a research. The thesis writing process came with many challenges. It has been an experience where I could develop my academic skills. I did not have that much experience with doing quantitative research, so committing to a thesis where quantitative data was included, was a real challenge.

Regarding to the topic of this thesis, my family and friends know me as a person that refuses to take the elevator, when there is an option to take the stairs. This awareness increased even more during my research in the past six-months. While reading and writing about, and experimenting with influencing people to use the stairs, I experienced a cognitive dissonance even more when not taking the stairs.

Firstly, I want to thank Jorinde Spook for being my supervisor, giving me feedback and supportive words throughout the whole thesis process. Secondly, I want to thank Laura Winkens, for being the second reader of my thesis. Also, I want to thank the WUR employees who were willing to participate in my study. Last but not least, a big thanks to my family and friends who have given (mental) support in my whole educational journey so far. To you, the reader of this thesis; have fun!

Claire Grootveld
Wageningen, February 2019

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1. Introduction

1.1 Mental health problems due to increasing psychological work pressure

According to the Central Bureau of Statistics Netherlands [CBS] (2018a) the current working population in the Netherlands consists of 8.747.000 people (53.4% males and 46.6% females). Psychological work pressure on Dutch employees varies among different working fields. It is perceived to be the highest in jobs in education, and the lowest in the field of agriculture and fishing (CBS, 2018b). On top of that, work pressure on employees in the Netherlands is increasing in general (TNO, 2017). Psychological work pressure has serious consequences on the mental health of employees, such as stress, anxiety, and depression (Stansfeld & Candy, 2006). Stress is described as "a negative emotional experience accompanied by predictable biochemical, physiological, cognitive, and behavioural changes that are directed either toward altering the stressful event or accommodating to its effects" (Baum, 1990). When experiencing stress over a longer period of time, mental health problems, such as burn-outs, can arise. A burn-out can be described as a condition where a person has lost their enthusiasm for work, has feelings of cynicism and has a low sense of personal accomplishment' (Shanafelt et al., 2012). To give an insight in the psychological conditions in the Dutch working field; 15.9% of the Dutch employees in 2017 had (symptoms of) a burn-out (CBS, 2018c). In the working field of education, the burn-out rates were even higher than the average in that same year (22.1%) (CBS, 2018b).

Mental health problems that arise due to psychological work pressure, such as work-related stress or burn-outs, can have an impact on the working performance of employees. Eventually, this can lead to decreased productivity and lower job attendance, or even long-term sickness of employees (Colligan & Higgins, 2006). In 2017, 4% of the total Dutch working population was reported absent, mostly for a period of 1-5 working days. Moreover, 18.2% was absent for 5-20 days, 10.8% for 20-210 days, and 1.1% of the Dutch employees were absent for more than 210 days (CBS, 2018d). Highest absenteeism in 2017 was reported in the work sector of governance, healthcare, industry, and education (Volksgezondheid en Zorg, n.d.). Reasons for workplace absenteeism can be work related, with a distinction of psychosocial work burden (PSA) or other causes (not-PSA). Employers and other parties are saddled with a financial burden, because of the workplace absenteeism. The PSA workplace absenteeism cost 2.7 billion euros in 2012, which was 55% of the total work-related workplace absenteeism costs (van der Ploeg, van der Pal, de Vroome, & van den Bossche, 2014). Due to the mental health consequences of the current psychological work pressure, the well-being of the Dutch working population is at stake. One key element that could contribute to the improvement of their physical as well as their psychological well-being, is the engagement in physical activity (PA).

1.2 Influence physical activity on health and stress levels

PA is defined as "all leisure and non-leisure body movements resulting in an increased energy output from the resting condition" (Warburton, Nicol, & Bredin, 2006). Mental health benefits of PA are amongst others: an improved mood, stress reduction, and reduction of symptoms of depression and anxiety (Penedo & Dahn, 2005).

Engagement in PA programs can help individuals to experience those mental health benefits. For example, doing a yoga program can help lower the perceived stress level of sedentary adults (Hewett, Pumpa, Smith, Fahey, & Cheema, 2018). However, more sedentary behaviour and less PA and exercise are performed when individuals are experiencing stress (Tomiyama, 2018). Despite all the known benefits of what PA can mean for the overall well-being of employees, stress can make it harder for employees to get moving. Since employees spend a great amount of their day at their workplace, Workplace Health Promotion Programs (after this: WHPP) gives opportunities to implement PA in their daily routine.

1.3 Workplace Health Promotion Programs

The workplace is internationally recognized as a health promoting setting (Quintiliani, Sattelmair, & Sorensen, 2007). WHPP are setup in the workplace to improve the health of employees. These programs are useful for various reasons, such as improvement in the health status of their employees, disease risk reduction and job productivity (Goetzel & Pronk, 2010). Often the focus of WHPP is on the physical health outcomes of their employees, with a goal of weight control or weight reduction (Anderson et al, 2009). Although WHPP can target many different health behaviours, most programs have a focus on individuals' risky health behaviours (e.g. smoking, stress levels, sedentary behaviour, poor nutrition) (O'Donnell, 2002). Examples of WHPP that target stress can occur in forms of meditation, or relaxation- and mindfulness trainings.

WHPP mainly focusses on stress reduction interventions that directly target the mental well-being. These stress management interventions have the ability to create long-lasting positive effects on the prevention of mental health problems (Herr et al., 2018). Stress management interventions, as part of a WHPP, do not regularly target the reduction of stress through PA (Holman, Johnson, & O'Connor, 2018). While some WHPP studies show that improvement appears in the overall health status of employees when PA is addressed as an outcome during the intervention period (Conn, Hafdahl, Cooper, Brown, & Lusk, 2009). However, when PA is used as a tool to improve the mental health of employees, it does not always have a proven significant effect on the mental health status and work engagement of employees (van Berkel et al., 2013). Also, a review on the effect of PA programs at the workplace among employees, showed inconclusive outcomes for factors such as job satisfaction, job stress, and overall well-being (Proper, Staal, Hildebrandt, van der Beek, & Mechelen, 2002). Variation was shown between the groups used in the study of the effect of PA on the job stress levels. However, no significant difference was found to proof that PA did lower job stress levels (Proper et al., 2002). To encourage healthier behaviours among employees, the work environment needs to be targeted in WHPP. This can be done through the social work environment (e.g. coaching programs), or the physical work environment (e.g. standing desks) (O'Donnell, 2002).

1.4 Targeting the work environment

Several WHPP studies focussed on the effects of (changes in) the physical work environment and the stimulation of PA in their employees. In these studies, the tools used to stimulate PA were evaluated (Engbers, van Poppel, Paw, & van Mechelen, 2005). The mentioned tools include the availability of exercise space and equipment, providing a walking track outside of the office, encouraging the use of stairs, and putting a red-line route to promote walking during lunchtime. Studies that have implemented these environmental changes at the workplace saw a significant increase in PA in the participants of the study (Engbers et al., 2005). At the workplace, PA can be encouraged through the use of stairs, which is targeted in various studies.

1.5 Workplace interventions targeting the use of stairs

Interventions targeting the use of stairs at the workplace can be effective, as it can increase employees' use of stairs during the intervention period (Bellicha et al., 2016). Motivational and directional signs, as well as improvement of the aesthetics of the staircase can steer employees into using the stairs. However, the increased use of stairs stimulated by these triggers only lasted during the intervention period (Bellicha et al., 2016). A study of Eves, Webb and Mutrie (2006) did show a lasting effect of increased use of stairs through prompts stimulating such behaviour at the workplace. Prompting individuals in the moment-of-choice, with stimulating posters to take the stairs instead of the elevator in public places, did increase staircase use. The effects, namely an increase in the use of stairs of these moment-of-choice prompts in the workplace were not found in earlier research discussed in Eves et al. (2006). Furthermore, not all workplace interventions targeting the use of stairs result in an increased use of stairs by employees. Another study by Åvitsland, Solbraa and Riiser (2017) that used stair leading footprints and stair-riser banners to influence the use of stairs, even showed a decrease in the use of stairs during the intervention, with another increase in the follow-up. In this study, negative feelings and irritation among employees arose, since the employees were influenced to engage in behaviour that they were already exhibiting. Therefore, the effectiveness of interventions targeting the use of stairs can differ among study populations, settings and the type of influence to promote the use of stairs. Besides prompting employees to take the stairs through posters and signs, another prompting method that can be used is part of Location-Based Communication (after this: LBC).

1.6 Location-Based Communication app

A recent innovation developed by Wageningen University & Research (after this: WUR) is the LBC-app. This app is used in real-time, real world situations to stimulate healthy behaviour, such as the use of stairs, by sending prompts to smartphones of employees. The interesting thing is about LBC is that it can be placed at the right place and 'sent out' at the right time, when the participant needs to be exposed to the reminder of the health behaviour that is targeted. However, research on LBC is still in its infancy.

1.7 Research aim and relevance

Since no prior research on LBC is available as of yet, investigating the usage of the newly developed LBC-app is highly innovative and valuable. This research specifically focuses on creating new insights into the effects of prompting via LBC in a workplace setting, as well as on the PA and stress levels of employees.

Besides scientific knowledge, this research adds to practical knowledge on how to use the LBC-app in a real-life situation. On top of that, it adds to practical knowledge for researchers on working with the LBC-app while conducting a research. Moreover, practical knowledge is gathered for employers and employees on how workplace stress can be managed.

The purpose of this study is to investigate whether LBC-app prompts encourage employees to use the stairs, and if the prompts, and the possible changes in the use of stairs, affects the perceived stress level of employees. The LBC-app prompts consists of a daily smartphone message, which will be elaborated upon in the method section.

2. Conceptual Framework

The field of behavioural science has several theories and concepts that could fit into this study, with the goal of influencing and changing behaviour. The concepts of nudging and rational override are found relevant for this study that focuses on LBC.

2.1 Nudging

Nudging is described as a reminder that will steer people into specific desired behaviours, while remaining their freedom of choice to act on any behaviour they want (Vonk, 2013). A nudge is a short message, that can be verbal (e.g. text or note) or non-verbal (e.g. influence in environment) (Vonk, 2013).

Nudging in the workplace can be described as "an adjustment in the physical work environment aimed at steering behaviour of people in a certain desired direction" (Meulensteen, Le Blac, & Kemperman, 2017). Although the literature on nudging at the workplace is limited, the literature that focused on researching the effects of workplace physical environment change found that it can steer the behaviour of employees into the desired direction. A determinant that can be influenced through workplace nudging directly, is the satisfaction of employees' needs (Meulensteen et al., 2017). Other determinants such as work engagement (i.e. *"feeling energetic at work", "happiness while working intensely", and "dedication to their work"*) and work performance (i.e. "*productive and efficient in their work"*), can indirectly be influenced through workplace nudging (Meulensteen et al., 2017).

However, nudging has the following disadvantages; nudges are mostly not personalised to the person who receives them, nudges only work within the setting in which they are placed, and nudges do not work within a similar context without the nudge. Lastly, nudges make the receivers inactive, since they do not have to actively do something to react to the nudge (Renes, 2018).

2.2 Rational Override

It can be questioned if a location-based smartphone prompt at the workplace can be considered as nudging. The content of the prompts has characteristics of a nudge, but the combination of the content of the prompts and using LBC to send the prompts can be considered as rational override. Rational override is defined by van Lieren, Calabretta and Schoormans (2018) as "a small moment of intentional friction that attempts to influence people's behaviour of decision-making by intervening automatic thinking and activating reflective conscious thinking". In other words, rational override strategies set reminders that help peoples' awareness to make active choices. An example of rational override is the beeping sound in a car to remind the driver that their seatbelt has not been put on yet (van Lieren et al., 2018).

Within this study, the 'beeping sound in the car' are the smartphone prompts (i.e. reminders), which are sent at the real-life location where the decision by participants must be made to take the stairs or the elevator. Awareness of the desired behaviour (using the stairs) is then created through the content of the prompts. In this way, rational override can create sustainable change through intentional friction, with the possibility of behaving in the same way in similar settings (Renes, 2018). When in future situations participants are considering whether to take the stairs or the elevator, these intentional frictions can make them use the stairs in similar settings. Regarding the prompt content, it can be beneficial to include normative influences.

2.3 Normative influences

Individuals have the natural instinct to belong to a group ('the need to belong'). People do not want to stand out, end up alone, or be seen as divergent. One concept that explains this principle is conformity: individuals always adjust their behaviour according to the behaviour of others (Vonk, 2013). One type of conformity is normative conformity; the behaviours of others will function as a way to create the norm of which behaviour is desired in a certain situation (Vonk, 2013). Normative conformity is a concept from social psychology, which can be used to influence the behaviour and decision making of individuals. Norms can be described as "an objective pattern of behaviour or a subjective expectation" (Morris, Hong, Chiu, & Liu, 2015). Norms refer to behaviours which are seen as common. Moreover, social norms are used to gain understanding of a situation, and to respond accordingly (Cialdini & Goldstein, 2004).

Various forms of norms exist, of which social norms fall within the part of subjective expectations. Two of those subjective expectations are perceived *descriptive norms* and perceived *injunctive norms*. Perceived descriptive norms function as a tool to shape the perception or frame the world of individuals. Judgment or behaviour of others function as the influence on their own individual behaviour (Morris et al., 2015). Descriptive norms are referred to what is commonly done. Perceived injunctive norms refer to what is commonly socially approved or disapproved (Cialdini et al., 2006), an example is experiencing peer pressure (Morris et al., 2015). Social rewards or punishments can be a consequence of (not) following injunctive norms and are therefore a motivation to obey the norms (Cialdini et al., 2006). Since the prompts are written messages in the LBC-app, the normative influences in their content are similar to descriptive norms.

Normative influences can be set up in the form of a nudge, even without the 'others' being present in that moment and just provide information about the behaviour of others. Studies are done in hotels to research the effect of descriptive normative social influence on the behaviour of hotel guests' towel reuse behaviour. The normative information stated that fellow guests already reused their towels. It became clear that people will reuse their towels when a descriptive norm message was set up (Schultz, Khazian, & Zaleski, 2008). This effect shows that even without any social interaction, descriptive normative messages have effect.

However, differences in effect between the descriptive norm message and a standard message do not always occur. In a study of Bohner and Schlüter (2014), the difference between a standard 'environmental message' which stated to reuse your towels because it is good for the environment, did not differ from the effect of the descriptive norm. Both had a positive effect on the reuse behaviour of towels of the hotel guests.

Within normative messages, provincial norms also matter. Provincial norms refer to matching the described normative message to the target group and situational circumstances the message is send in (Goldstein, Cialdini, & Griskevicius, 2008). People are most likely to follow-up behaviour and norms of people with similar features. Framing normative messages in this way is found most effective (Goldstein et al., 2008). Moreover, negatively worded descriptive normative messages are found most ineffective (Cialdini et al., 2006). Therefore, sending positive worded descriptive norms, which are matched to the situation and target group can be most effective within this study.

Comparing this information to workplace settings, normative messages can be a powerful tool to influence the decisions of employees. Descriptive norms are already used in various WHPP (Quintiliani et al., 2007). Descriptive norm messages can stimulate light PA of employees and decrease sedentary behaviours (Priebe & Spink, 2015). In a study that influenced office workers' PA levels through descriptive norms, greatest effect was found in the use of stairs (which increased by 26%) (Priebe & Spink, 2012). Thus, descriptive norms can function as a tool to influence employees' PA behaviour at the workplace.

2.4 Framing health messages

Besides social norms, nudging in form of sending health messages to individuals, can also influence behaviour. When targeting preventive health behaviour, messages to stimulate these behaviours can best be formulated in a positive way, with focus on what individuals can gain when engaging in these behaviours (Rothman, Martino, Bedell, Detweiler, & Salovey, 1999). A similar effect can be found in a study by Gallagher and Updegraff (2012), where effects of gain-framed and loss-framed health behaviour messages are studied. Framing the benefits (gains) of participating in the stimulated health behaviours is seen as more effective, than framing the consequences (losses) of not participating in the health behaviours (Gallagher & Updegraff, 2012). Moreover, promoting the positive effects of PA (gain) in the health message, has significantly more chance to lead to actual engagement in PA, when compared to framing the health message with the 'losses' when not engaging in PA (Gallagher & Updegraff, 2012). These studies give an indication of what a difference the framing of the prompt content could make. Prompting employees with positive framed health messages can be used to stimulate PA in this study.

2.5 Hypotheses

The hypothesised outcome of this study is a decreased perceived stress level of employees, through an increased use of stairs, which is stimulated by the content of the LBC-app prompts. The hypothesised effects of the prompts on the use of stairs and perceived stress level of employees are displayed in Figure 1.

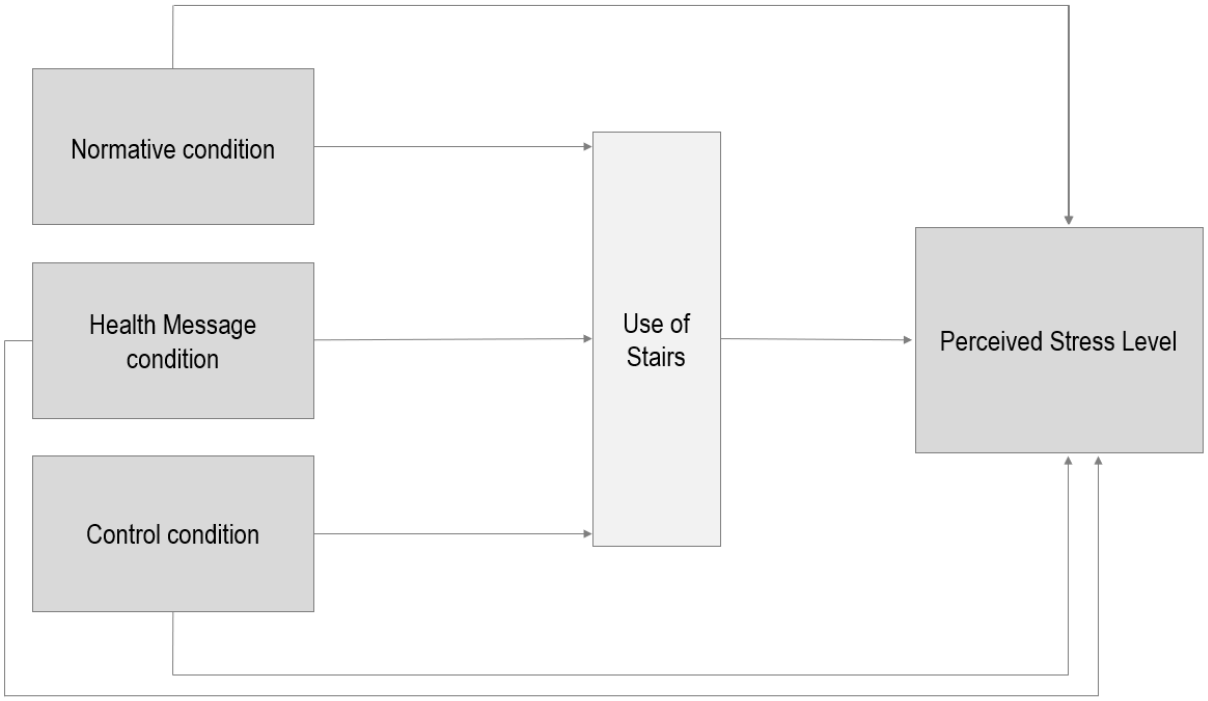

Figure 1. *Expected effects of the three prompt conditions on the PA behaviour (the use of stairs) of employees and their perceived stress level.*

Based on the literature described in this chapter, the following hypotheses are formed:
H1: Taking the stairs at work decreases employees' perceived stress level.

H2: Prompting employees with smartphone messages that contain descriptive normative, or health benefit information on the use of stairs, increases employees' use of stairs compared to the control prompt condition.

H3: Prompting employees with smartphone messages that contain descriptive normative, or health benefit information on the use of stairs, increases employees' use of stairs, and thereby decreases employees' perceived stress level, compared to the control prompt condition.

However, smartphone notifications are found to increase stress levels (Mikulic, 2016). Both the physical reminder of the notification (e.g. sound, vibration) and the content of the message can cause stress (Yoon & Lee, 2015). Within this study it could be possible that the smartphone prompts itself cause stress (without the mediating factor of PA), which is a less desired effect.

Thereby the paradox is included in form of the following hypothesis:
H4: Prompting employees with smartphone messages that contain information on the use of stairs, increases employees' perceived stress level.

3. Methods

3.1 Research design and participants

This study yielded a three-arm pre- and post-test controlled trial. Two intervention groups were used; a normative condition [EXP1] and a health message condition [EXP2], and one control group [CONT3].

The participants were employees of WUR working at the building Leeuwenborch on floor 2, 3, and 4. Figure 2 displays the number of participants at baseline (before sending out the baseline questionnaires), pre- and post-test. The final sample (N = 17) that completed both the pre- and post-test questionnaire had a distribution of 5 (29.4%) males and 12 (70.6%) females, with an average age of 42.8 (SD = 14.7).

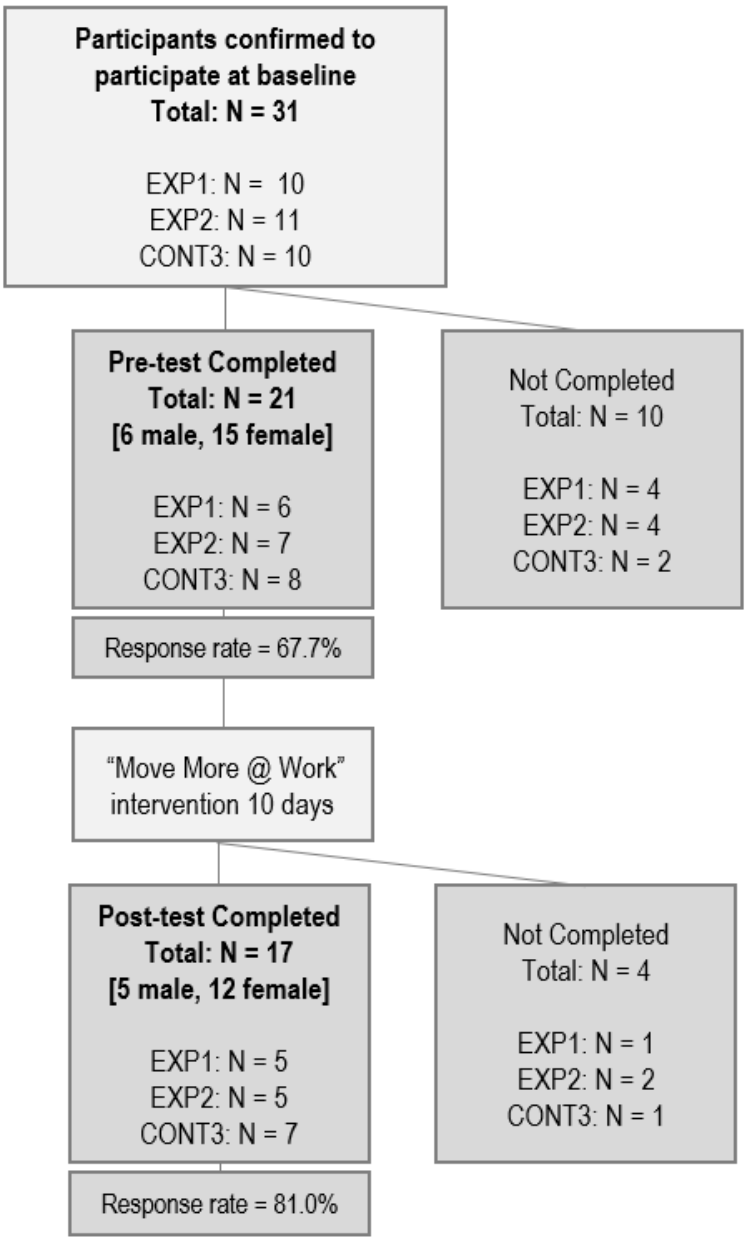

Figure 2. *Participants and response rate at baseline, after pre-test, and at post-test.*

3.2 Intervention: “Move More @ Work”

The app that made prompting possible is called the ‘LBC’-app. The technology that notified smartphones in the nearby area, and sent prompts to smartphones, is called a beacon.

3.2.1 LBC-app

Prompts could only be received by the participant when; the LBC-app was downloaded, participants had registered in the LBC-app, if the LBC-app was running in the background, and the Bluetooth and notifications on the smartphone were activated. The LBC-app only worked on Android smartphones. Six participants used their own smartphone during the study, and 6 participants used a borrowed smartphone. The LBC-app and beacons were tested by the researcher with multiple Android smartphones before the start of the intervention.

3.2.2 Prompting during intervention

The beacons were placed from January 14th till January 25th at the hall nearby the stairs and the elevator of floor 2, 3 and 4 of the Leeuwenborch. Therefore, prompting by the LBC-app was possible for 10 (working) days. Below the beacons, a warning sign was placed with the text to please not remove the beacon (Appendix A). Every intervention day around 10.00 ‘o clock in the morning the researcher replaced the beacons with the matching beacon according to the randomisation schedule (Appendix B1).

3.2.3 Prompt content variations

Each floor was randomly assigned to one of the three conditions. Each condition [EXP1, EXP2 and CONT3] had three different prompt content variations. Each intervention day was randomly assigned to one of these prompt content variations, to create variation in the sent prompts, and prevent habituation of the repeated prompt messages. The prompt content that was used in the present study was based on studies of Bohner and Schlüter (2014) and Schultz et al. (2008), which showed effects of different messages on the reuse behaviour of bath towels in hotels. The Dutch translation of the prompt content was used in the intervention (Appendix C).

The prompt content per condition was formulated as followed;

- The *normative condition [EXP1]* sent out one of the following prompt content variations:
    1. “Almost 75% of the Dutch working population take the stairs going down instead of the elevator. You can also take the stairs instead of the elevator going down.”
    2. “Most WUR employees take the stairs going down. Do you also take the stairs instead of the elevator going down?”
    3. “Employees who have an office job are more inclined to take the stairs going down. You can also take the stairs instead of the elevator going down.”

- The *health message condition [EXP2]* sent out one of the following prompt content variations:
  1. "Taking the stairs instead of the elevator improves your total health status. To experience this health effect, you can take the stairs instead of the elevator to go down."
  2. "Taking the stairs improves your physical fitness. Do you also take the stairs instead of the elevator going down?"
  3. "Through taking the stairs regularly, your mental well-being improves. You can also take the stairs going down instead of the elevator."

- The *control condition [CONT3]* sent out one of the following prompt content variations:
  1. "Do you also take the stairs instead of the elevator going down today?"
  2. "Instead of taking the elevator going down, you can also take the stairs down."
  3. "You could take the stairs going down, instead of taking the elevator."

3.2.4 Assignment participants and prompt content variations

Random assignment of the conditions EXP1, EXP2 and CONT3 to the participating floors was done via cluster randomisation through dice rolling (see Figure 3). Randomisation of the prompt content variations to all intervention days was also done via the similar cluster dice rolling, repetition was allowed in the randomisation (Appendix B).

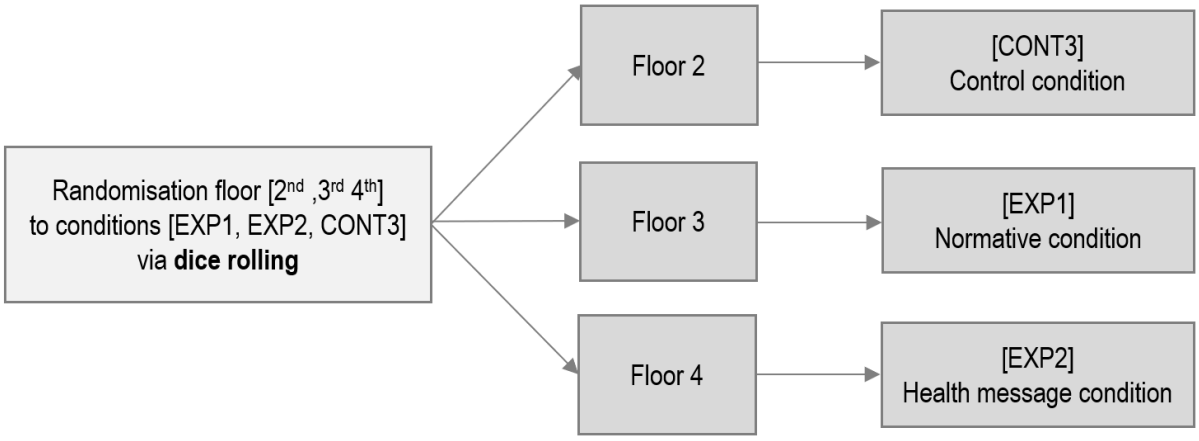

Figure 3. *Randomisation scheme for assignment floor 2, 3 or 4 to condition EXP1, EXP2 or CONT3 via dice rolling.*

3.3 Procedure

3.3.1 Recruitment participants

Before the start of recruitment of WUR employees as participants of the present study, permission was asked to the Vital@SSG group. Recruitment was done through posters (Appendix D) at the 2nd, 3rd and 4th floor of the Leeuwenborch, and through flyers in the post-box of employees at those floors.

Furthermore, e-mails were sent to the chair group holders of the departments. After permission of the chair group holders, the secretary was contacted of that same chair group. Finally, permission for the study was also given by dr. ir. M.M. Hackmann. After, recruitment of participants was continued through face to face contact with WUR employees, and through personally addressed e-mails to WUR employees of floor 2, 3, and 4.

3.3.2 Questionnaires and prompting

WUR employees who agreed upon participation, received further information on the study and instructions on how the LBC-app could to be downloaded. Participants were asked to use their own, or a borrowed smartphone during the intervention. Participants who owned an iPhone or other non-Android smartphone, used a borrowed Android smartphone provided by the researcher or arranged for one by themselves (via friends or family). The participants were informed on what they could expect of the smartphone prompts and the LBC-app.

On January 8th participants received the pre-test questionnaire via e-mail, which included an informed consent at the start of the questionnaire (Appendix E1). Participants had six days to complete the baseline questionnaire. Participants could be prompted in a range distance of 7 metres from the beacon. When the participant was prompted, a notification appeared on the home screen and in the notification bar at the top of the smartphone screen. The notification of the prompt was called “Move More @ Work” (Appendix A). A few participants received a follow-up e-mail to see if they had received a prompt in the first week of the intervention. Participants received the post-test questionnaire at 12.00 on the last intervention day (January 25th). Participants had 5 days to complete the post-test questionnaire (Appendix E2).

3.4 Measures

After a short introduction in the pre- and post-test, the following variables were measured: demographic variables, use of stairs and perceived stress level. In the post-test questionnaire, control questions were measured on the smartphone prompts and the feasibility and usability of the LBC-app. The pre- and post-test questionnaires were included in Appendix E1 and E2. Examples of items in the following paragraphs were translated from the pre- and post-test from Dutch to English, excluding the example items of the Perceived Stress Questionnaire.

3.4.1 Pre-test

3.4.1.1 Demographic variables

Demographic variables included gender, age, educational level, and physical disabilities. A question to measure on which floor the respondents work at in the Leeuwenborch was also included. In this way, it could be determined to which condition the respondent belonged to.

3.4.1.2 Use of stairs

Questions to measure to use of stairs were based on a previous completed study of Åvitsland et al. (2017). Measurements included: the reason to take or not take the stairs at work (e.g. *"what is the most important reason to not take the stairs at work?"*), the number of floors the respondent is willing to walk, and how often the respondent walks the stairs. All questions on the use of stairs had single answer options, including the option to choose 'other', which contained an open field for written text (e.g. answer options on reasons to take the stairs are: *"health", "sport / training", "time efficiency", "habit", "other:___", or "I never take the stairs at work").*

3.4.1.3 Perceived stress level

The perceived stress level was measured through a validated, revised version of the 'Perceived Stress Questionnaire' (after this: PSQ) by Levenstein et al. (1993) that is discussed in the article of Fliege et al. (2005) (Appendix F).

The revised PSQ consisted of four scales: "worries", "tension", "joy" and "demands" (e.g. worries: *"You fear you may not manage to attain your goals"*). The PSQ contained 20 items (5 items per scale). Referring to the past four weeks, respondents had to rate via a slider how often an item applies to them, on a scale from 0 (never) to 1 (usually) (Fliege et al., 2005). A total average score of < .50 on the PSQ reflected a low perceived stress level, .50 reflected a neutral score, and > .50 a high perceived stress level. In the total score the scale "joy" was recoded, because in the original "joy" scale a high score (> .50) reflects a positive meaning. Since there was no Dutch translation available of the PSQ, the items were translated to Dutch by the researcher. Contra-indictive items of the PSQ were recoded. The Cronbach's alpha of the PSQ was $\alpha = .81$, which showed a good internal consistency.

3.4.2 Post-test

Demographic variables, use of stairs and perceived stress level were measured by the same items as used in the pre-test. No further changes were made. The post-test also included control questions on the smartphone prompts as well as feasibility and usability of the LBC-app.

3.4.2.1 Smartphone prompts

Control questions on receiving the smartphone prompts were measured by 6 items. Questions on: how many days participants were present at the Leeuwenborch, if participants had received the prompts, the daily frequency of the prompts, which prompt variations the participants had received, and if participants thought their use of stairs had changed compared to baseline (e.g. "*Do you think that in the past two weeks you have made use of the stairs more frequently because of the smartphone prompts?"*). The influence of the prompts on the participants was measured as well (e.g. "*I became more aware of how many times I take the stairs")*. Multiple choice answers were allowed for the items on which prompt variations the participant had received, and for the item how the participants were influenced by the prompts (including an "other" option, which contained an open field for written text). The other 4

items only allowed single choice answer options (e.g. answer options on if their frequency of using the stairs has changed are: *"yes, increased", "no, decreased"* or "*no, remained the same").*

3.4.2.2 Feasibility and usability

Feasibility and usability measures of the LBC-app were based on other studies of Åvitsland et al. (2017), and Spook, Paulussen, Kok and van Empelen (2013). In total, 6 statements were used on user friendliness of the LBC-app (e.g. "the LBC-app was user friendly), prompt frequency (e.g. *"the frequency of the prompts was too much"*), and understandability (e.g. *"the content of the prompt was understandable"*). Responses were measured through a scale of 0 (totally disagree) to 1 (totally agree). A total average score of < .50 on the LBC-control scale reflected a low feasibility and usability, .50 reflected a neutral score, and > .50 a high feasibility and usability. Contra-indictive items required recoding. After that, the feasibility and usability of the LBC-app was considered positive when scale responses were above the midpoint. The Cronbach's alpha was $\alpha = .168$, which showed an unacceptable internal consistency.

3.5 Analysis

SPSS Statistics 25 was used for data analysis. Data were checked for outliers and variables were checked for normality before the main analyses were performed. Data preparation was done by combining the pre- and post-test data into one dataset and recoding variables if needed. All variables were described using means, percentages and standard deviations. ANCOVA analyses were conducted to examine a difference between the pre- and post-test, and between the three conditions [EXP1, EXP2 and CONT3] in variables for the use of stairs and the perceived stress level. To examine the effect in the three conditions of the prompts on the use of stairs and the perceived stress level, and the effect of the variables for the use of stairs on the perceived stress level, a simple linear regression analyses were conducted. A p-value of < .05 was considered significant.

4. Results

4.1 Demographic characteristics

Demographic characteristics of the participants per condition and total numbers of the pre- and post-test can be found in Table 1. The final sample that completed both the pre- and post-test questionnaire had a distribution of 5 (29.4%) males and 12 (70.6%) females, with an average age of 42.8 (SD = 14.7). A physical barrier to walking the stairs was reported by 2 participants (an injury and a chronical condition).

Table 1. *Demographic characteristics of the participants per condition and total numbers of the pre- and post-test.*

		Pre-test (N = 21) Means ± SD	**Post-test (N = 17) Means ± SD**
Gender (%)	*EXP1*		
	Women	33.3% (N = 2)	40.0% (N = 2)
	Men	66.7% (N = 4)	60.0% (N = 3)
	EXP2		
	Women	85.7% (N = 6)	80.0% (N = 4)
	Men	14.3% (N = 1)	20.0% (N = 1)
	CONT3		
	Women	87.5% (N = 7)	85.7% (N = 6)
	Men	12.5% (N = 1)	14.3% (N = 1)
Age	*EXP1*		
		56.0 ± 7.1	52.4 ± 11.1
	EXP2		
		39.4 ± 11.6	37.4 ± 13.3
	CONT3		
		40.0 ±15.1	40.0 ± 16.3
Educational level (%)	*EXP1*		
	HBO	16.7% (N = 1)	20.0% (N = 1)
	WO	83.3% (N = 5)	80.0% (N = 4)
	EXP2		
	HBO	14.3% (N = 1)	-
	WO	85.7% (N = 6)	100% (N = 5)
	CONT3		
	HBO	-	-
	WO	100% (N = 8)	100% (N = 7)
Physical barrier (%)	*EXP1*		
	Yes	16.7% (N = 1)	40.0% (N = 2)
	No	83.3% (N = 5)	60.0% (N = 3)
	EXP2		
	Yes	-	-
	No	100% (N = 7)	100% (N = 5)
	CONT3		
	Yes	-	-
	No	100% (N = 8)	100% (N = 7)

4.1.1 Differences between conditions

ANOVA analyses were done to test differences in the demographic characteristics between the condition EXP1, EXP2 and CONT3 in the pre- and post-test. A significant difference in gender is found between the three conditions in the pre-test, with F (2, 18) = 3.58 (p = .05). In the pre-test, EXP1 had a higher number of participating men (N = 4) then EXP2 (N = 1) and CONT3 (N = 1). A significant difference in age is found between the three conditions in the pre-test, with F (2, 18) = 3.85 (p = .04). In the pre-test, EXP1 had a higher mean age (56.0 ± 7.1) than EXP2 (39.4 ± 11.6) and CONT3 (40.0 ± 15.1). No significant difference was found between the three conditions in the pre-test in educational level, with F (2, 18) = .63 (p = .54), and physical barriers, with F (2, 18) = 1.29 (p = .30). No significant difference was found between the conditions in the post-test in gender (F (2,14) = 1.65 (p = .23)), age (F (2,14) = 1.65 (p = .23)), educational level (F (2,14) = 1.24 (p = .32)), and physical barriers (F (2,14) = 3.30 (p = .07)).

4.2 Motivations to use the stairs

4.2.1 Descriptives motivations to use the stairs

Frequencies in the pre- and post-test per condition on reasons to take and do not take the stairs at work are shown in Table 2 and 3. In the pre- and post-test, health is considered as the most important reason to take the stairs at work in all conditions. In the pre-test, the most frequent answer to not take the stairs at work was social reasons in EXP1 (33.2%), habitual behaviour in EXP2 (28.6%), and in CONT3 most participants reported to always take the stairs (62.5%). In the post-test, the most frequent answer on why they opted not to take the stairs at work was laziness in EXP1 (40.0%), carrying personal belongings in EXP2 (40.0%), and in CONT3 most participants reported to always take the stairs (71.4%).

4.2.2 Differences between conditions

ANOVA analyses were done to test differences between the conditions in reasons to take or not take the stairs at work. No significant difference was found between the conditions in reasons to take the stairs, with F (2,18) = .412 (p = .67) in the pre-test, and F (2,18) = 1.373 (p = .28) in the post-test. No significant difference was found between the conditions in reasons to not take the stairs, with F (2,14) = .561 (p = .58) in the pre-test, and F (2,14) = .048 (p = .95) in the post-test.

Table 2. *Pre- and post-test frequencies per condition on reasons to take the stairs at work.*

	Reasons to take the stairs	pre-test	post-test
EXP1	*Health*	66.6% (N = 4)	60.0% (N = 3)
	Environment	16.7% (N = 1)	-
	Sport / Training	16.7% (N = 1)	20.0% (N = 1)
	Efficiency (time)	-	-
	Habit	-	-
	I never take the stairs	-	20.0% (N = 1)
EXP2	*Health*	42.9% (N = 3)	80.0% (N = 4)
	Environment	-	-
	Sport / Training	28.6% (N = 2)	20.0% (N = 1)
	Efficiency (time)	14.3% (N = 1)	-
	Habit	-	-
	I never take the stairs	14.3% (N = 1)	-
CONT3	*Health*	75.0% (N = 6)	71.4% (N = 5)
	Environment	-	-
	Sport / Training	-	-
	Efficiency (time)	12.5% (N = 1)	-
	Habit	12.5% (N = 1)	28.6% (N = 2)
	I never take the stairs	-	-

Table 3. *Pre- and post-test frequencies per condition on reasons to not take the stairs at work.*

	Reasons to not take the stairs	pre-test	post-test
EXP1	*I always take the stairs*	16.7% (N = 1)	20.0% (N = 1)
	Efficiency (time)	16.7% (N = 1)	-
	Habit	16.7% (N = 1)	20.0% (N = 1)
	Lazy (tired)	16.7% (N = 1)	40.0% (N = 2)
	Social reasons (colleagues)	33.2% (N = 2)	20.0% (N = 1)
	Personal belongings (luggage)	-	-
	Reward after effort	-	-
	Sickness	-	-
EXP2	*I always take the stairs*	14.3% (N = 1)	20.0% (N = 1)
	Efficiency (time)	14.3% (N = 1)	-
	Habit	28.6% (N = 2)	-
	Lazy (tired)	14.3% (N = 1)	-
	Social reasons (colleagues)	-	-
	Personal belongings (luggage)	14.3% (N = 1)	40.0% (N = 2)
	Reward after effort	14.3% (N = 1)	20.0% (N = 1)
	Sickness	-	20.0% (N = 1)
CONT3	*I always take the stairs*	62.5% (N = 5)	71.4% (N = 5)
	Efficiency (time)	12.5% (N = 1)	28.6% (N = 2)
	Habit	-	-
	Lazy (tired)	25.0% (N = 2)	-
	Social reasons (colleagues)	-	-
	Personal belongings (luggage)	-	-
	Reward after effort	-	-
	Sickness	-	-

4.3 Variables for the use of stairs

4.3.1 Descriptives variables for the use of stairs

Per condition, the frequencies, means and mean differences of the pre- and post-test variables for the use of stairs (PA); 1) number of floors *willing to walk* down with the stairs (PA1), 2) frequency currently *walking down* the stairs per day (PA2), and 3) frequency *walking up* the stairs per day (PA3) can be found in Table 4. CONT3 has a higher mean on all variables for the use of stairs, compared to EXP1 and EXP2. No major differences are present *between the pre- and post-test* in the scores for variables for the use of stairs. Differences *between conditions* in variables for the use of stairs are present. EXP1 has a lower average score in walking down (-.47) and walking up the stairs (-.50). Conditions EXP2 and CONT3 have higher average scores, with EXP2 a difference of .20 in walking down and .46 in walking up the stairs, and CONT3 has a difference of .26 in walking up the stairs. The average score on the number of floors willing to walk down in CONT3 has a difference of -.42.

4.3.2 Differences between pre- and post-test

To test differences *between the pre- and post-test* of variables for the use of stairs (PA1, PA2 and PA3) in the three conditions, ANCOVA analyses were done with age and gender as covariates. No significant difference is found in EXP1 between the pre-and post-test for variables PA1 ($F (1, 11) = .01$ ($p = .92$), PA2 ($F (1, 11) = .40$ ($p = .55$) and PA3 ($F (1, 11) = .59$ ($p = .47$), when controlled for gender and age. No significant difference is found in EXP2 between the pre-and post-test for variables PA1 ($F (1, 12) = .04$ ($p = .85$), PA2 ($F (1, 12) = .05$ ($p = .83$) and PA3 ($F (1, 12) = .27$ ($p = .62$), when controlled for gender and age. No significant difference is found in CONT3 between the pre-and post-test for variables PA1 ($F (1, 15) = .37$ ($p = .56$), PA2 ($F (1, 15) = .80$ ($p = .39$) and PA3 ($F (1, 15) = .80$ ($p = .39$), when controlled for gender and age.

4.3.3 Differences between conditions

To test differences *between the three conditions* of the variables for the use of stairs in the pre- and post-test ANCOVA analyses were done with age and gender as covariates. No significant difference between the three conditions is found in the pre-test in variables PA1 ($F (2, 21) = .89$ ($p = .43$), PA2 ($F (2, 21) = .38$ ($p = .69$), PA3 ($F (2, 21) = 1.36$ ($p = .27$), when controlled for gender and age. No significant difference between the three conditions is found in the post-test in variables PA1 ($F (2, 17) = .10$ ($p = .91$), PA2 ($F (2, 17) = 2.28$ ($p = .15$), PA3 ($F (2, 17) = 2.27$ ($p = .15$), when controlled for gender and age.

4.3.4 Prompt effect on the use of stairs

A simple linear regression analysis was used to predict the use of stairs from the received prompts. In EXP2 two participants received the prompts, no data on prediction was available in EXP2 and CONT3. In EXP2, the prompts did not significantly predict the use of stairs with $t (1) = -.23$ ($p = .83$). No significant relation is shown between receiving the prompts and the use of stairs, therefore H2 is rejected.

Table 4. *Frequencies of the variables for the use of stairs in the pre- and post-test.*

			Pre-test (N = 21) %	Post-test (N = 17) %	pre-test Means ± SD	post-test Means ± SD	Mean Difference
Number of floors willing to walk down with the stairs (PA1)	EXP1	2 floors	-	-	4.50 ± 1.23	4.60 ± 1.34	.10
		3 floors	16.7% (N = 1)	20.0% (N = 1)			
		4 floors	50.0% (N = 2)	40.0% (N = 2)			
		5 floors	-	-			
		6 > floors	33.3% (N = 2)	40.0% (N = 2)			
	EXP2	2 floors	14.3% (N = 1)	20.0% (N = 1)	4.29 ± 1.50	4.40 ± 1.67	.11
		3 floors	14.3% (N = 1)	-			
		4 floors	28.6% (N = 2)	40.0% (N = 2)			
		5 floors	14.3% (N = 1)	-			
		6 > floors	28.6% (N = 2)	40.0% (N = 2)			
	CONT3	2 floors	-	-	5.13 ± .99	4.71 ± 1.38	-.42
		3 floors	-	28.6% (N = 2)			
		4 floors	37.5% (N = 3)	14.3% (N = 1)			
		5 floors	12.5% (N = 1)	14.3% (N = 1)			
		6 > floors	50.0% (N = 4)	42.9% (N = 3)			
Frequency currently walking down the stairs per day (PA2)	EXP1	None	-	20.0% (N = 1)	2.67 ± .81	2.20 ± .84	-.47
		1 / 2 times	50.0% (N = 3)	40.0% (N = 2)			
		3 / 4 times	33.3% (N = 2)	40.0% (N = 2)			
		5 / 6 times	16.7% (N = 1)	-			
	EXP2	None	14.3% (N = 1)	-	2.60 ± .98	2.80 ± .84	.20
		1 / 2 times	28.6% (N = 2)	40.0% (N = 2)			
		3 / 4 times	42.9% (N = 3)	40.0% (N = 2)			
		5 / 6 times	14.3% (N = 1)	20.0% (N = 1)			
	CONT3	None	-	-	2.88 ± .64	3.14 ± .38	.26
		1 / 2 times	25.0% (N = 2)	-			
		3 / 4 times	62.5% (N = 5)	85.7% (N = 6)			
		5 / 6 times	12.5% (N = 1)	14.3% (N = 1)			
Frequency currently walking up the stairs per day (PA3)	EXP1	None	-	20.0% (N = 1)	2.50 ± .84	2.00 ± .71	-.50
		1 / 2 times	66.7% (N = 4)	60.0% (N = 3))			
		3 / 4 times	16.7% (N = 1)	20.0% (N = 1)			
		5 / 6 times	16.7% (N = 1)	-			
	EXP2	None	42.9% (N = 3)	20.0% (N = 1)	2.14 ± 1.22	2.60 ± 1.4	.46
		1 / 2 times	14.3% (N = 1)	20.0% (N = 1)			
		3 / 4 times	28.6% (N = 2)	40.0% (N = 2)			
		5 / 6 times	14.3% (N = 1)	20.0% (N = 1)			
	CONT3	None	-	-	2.88 ± .64	3.14 ± .38	.26
		1 / 2 times	25.0% (N = 2)	-			
		3 / 4 times	62.5% (N = 5)	85.7% (N = 6)			
		5 / 6 times	12.5% (N = 1)	14.3% (N = 1)			

4.4 Perceived Stress Level

4.4.1 Descriptives perceived stress level

As shown in Table 5, the means of the perceived stress level (PSQ total) of participants is below or almost equal to .50, which indicates a low to neutral perceived stress level. Minimal differences in the perceived stress level were found between the pre- and post-test. Differences between the three conditions were present. In condition EXP2, a negative mean difference is present in the PSQ total score (-.015). The other two conditions had a similar positive mean difference between the pre- and post-test, with EXP1 (.013) and CONT3 (.012).

Table 5. *Means and Standard Deviation of the perceived stress level (PSQ total) in the pre- and post-test per condition.*

	Pre-test	Means ± SD	Post-test	Means ± SD	Mean Difference
Perceived stress level (PSQ total)	*EXP1*	.344 ± .100	*EXP1*	.357 ± .104	.013
	EXP2	.528 ± .159	*EXP2*	.513 ± .167	-.015
	CONT3	.292 ± .121	*CONT3*	.304 ± .105	.012

4.4.2 Differences between pre- and post-test

ANCOVA analyses were conducted to test whether per condition, there was a difference *between the pre- and post-test* in the perceived stress level. No significant difference was found between the pre- and post-test perceived stress level in each condition, with EXP1 ($F(1, 11) = .02$ ($p = .89$), EXP2 ($F(1, 12) = .01$ ($p = .97$), and CONT3 ($F(1, 15) = .10$ ($p = .77$), when controlled for gender and age.

4.4.3 Differences between conditions

ANCOVA analyses were conducted to test whether the means differences differed *between the three conditions* in the perceived stress level. No significant difference was found between the three conditions in the mean differences of the perceived stress level, with $F(2, 17) = 1.40$ ($p = .29$), when controlled for gender and age. ANCOVA analyses were conducted to test whether the means in the pre- or post-test separate differed *between the three* conditions in the perceived stress level. A significant difference between the conditions in the perceived stress level is found in the pre-test, with $F(2, 21) = 6.65$, $p = .01$, when controlled for gender and age. In the pre-test, the PSQ total score is highest in EXP2, with .528 (SD = .159), compared to condition EXP1 with .344 (SD = .100) and CONT3 with a score of .292 (SD = .121). This significant difference between the conditions is not found in the post-test.

4.4.4 The use of stairs effect on perceived stress level

A simple linear regression analyses was used per condition to predict the perceived stress level from the variables for the use of stairs PA1, PA2 and PA3 in the pre- and post-test. PA1 did not significantly predict the perceived stress level in condition EXP1 ($t(3) = 1.08$ ($p = .32$)) and CONT3 ($t(3) = .01$ ($p = .99$)). PA1 did significantly predict the perceived stress level in condition EXP2, with $t(2) = -3.40$ ($p = .01$). PA2 did not significantly predict the perceived stress level in condition EXP1 ($t(3) = -.37$ ($p = .67$)), EXP2 ($t(2) = 2.11$ ($p = .07$), and CONT3 ($t(3) = -1.18$ ($p = .26$)). PA3 did not significantly predict the perceived stress level in condition EXP1 ($t(3) = -.50$ ($p = .57$)) and EXP2 ($t(3) = -1.14$ ($p = .29$)). H1 is rejected, since no significant relation is shown between the use of stairs and the perceived stress level.

4.4.5 Prompt effect on the use of stairs and perceived stress level

The prompts almost significantly predict the perceived stress level with t (1) = 3.068 (p = .06). H4 is rejected, since no significant relation is shown between the prompts and the perceived stress level. The mediating effect of the variables for the use of stairs is tested through a simple linear regression, to predict the perceived stress level from the prompts. When adding the variables for the use of stairs to the regression, no significant prediction was found of the prompt effect on the perceived stress level through the use of stairs. H3 is rejected, since no significant relation is shown between the prompts and the perceived stress level, with a mediating role of the use of stairs.

4.5 Feasibility and usability prompts and LBC-app

The post-test questionnaire shows that participants were on average 7.47 days (SD = 1.87) present at their floor of the Leeuwenborch. One participant was only 2 out of the 10 intervention days present, but the rest of the participants were present for 5 or more days. In Table 6 the means and SD per condition of the LBC-control items can be found.

Table 6. *Means, Standard Deviation and differences between prompt receivers and non-prompt receivers, per condition of items measuring the feasibility and usability of LBC in the post-test.*

		Means ± SD	df	F	p
The LBC-app was user friendly	EXP1	.308 ± .260	-	-	-
	EXP2	.366 ± .154	1, 17	.03	.89
	CONT3	.289 ± .363	-	-	-
The frequency of the prompts was too much	EXP1	.100 ± .209	-	-	-
	EXP2	.124 ± .214	1, 17	.39	.64
	CONT3	.089 ± .185	-	-	-
The prompts did not show correctly on my smartphone	EXP1	.100 ± .215	-	-	-
	EXP2	.788 ± .242	1, 17	.01	.94
	CONT3	.089 ± .198	-	-	-
I carried the smartphone with me every day	EXP1	.528 ± .464	-	-	-
	EXP2	.808 ± .202	1, 17	.60	.58
	CONT3	.861 ± .337	-	-	-
The LBC-app worked well	EXP1	.302 ± .440	-	-	-
	EXP2	.200 ± .235	1, 17	.01	1.00
	CONT3	.307 ± .388	-	-	

ANCOVA analyses were conducted to test differences *between participants who had received the prompts, and participants who did not received the prompts* in the items measuring the feasibility and usability of LBC in the post-test, controlling for gender and age. Only participants from EXP2 received the prompts, and as shown in Table 6, no significant difference is found in all items between participants who had and had not received a prompt during the intervention.

4.6 Additional results: Prompts exposure

After the study was finished, results and personal contact with the participants showed that in total, only two participants from condition EXP2 did receive the prompts. The other 15 participants reported that they did not receive the prompts during the intervention. The two participants received both prompting variation 1 of condition EXP2. One of those two participants of condition EXP2 reported that they also received prompt variation 1 and 3 of condition EXP2. The frequency of the use of stairs as stimulated through the content of the prompts was reported by all participants as 'did not change' during the 2 intervention weeks. Therefore, it can be concluded that previous reported results are unreliable, as no clear deviation between conditions was actually made with LBC.

4.6.1 Additional prompt check after intervention

An additional check with three different smartphones (S1, S2 and S3) was done to see why no prompts were received during the intervention by most participants. The check showed that all the 9 beacons used during the intervention were active and able to send prompts to the LBC-app, when the Bluetooth the smartphone was on. Also, the check showed that the LBC-app first had to be opened on all smartphones, in order to receive the prompts.

The check with the first smartphone (S1) clarified that the phone was able to receive the prompts when the participant was standing in a range distance of 7 metres. The prompt frequency was consistent within this range with 6 prompts per minute when standing still. In some cases, the app first needed to be opened to be able to receive prompts (again). When walking by the beacon with S1, the prompts were received by the smartphone 1 out of 5 times it was tested. The only time the prompt was received, was when walking slowly when coming close to the beacon.

The check with the second smartphone (S2) clarified that the phone was not able to receive the prompts when standing in a range distance of 7 metres. The prompting distance range was 1 to 2 metres. The proof of difference in prompting range is shown in Appendix G. The prompt frequency was not consistent within this range. Prompts appeared a few times regularly as a notification. Other times no notification was shown. The prompt frequency was 4 prompts per minute when standing still. In some cases, the app needed to be opened first to be able to receive prompts (again). In some cases when the "Move More @ Work" notification appeared on S2, the researcher clicked on it, but no prompt content was shown. Moreover, in some cases when the researcher clicked on the notification, the prompt content only showed up after a few seconds in the LBC-app. Prompting only occurred when standing right in front of the beacon. When walking by the beacon with S2 in a regular walking pace, prompts were not received by the smartphone.

The check with the third smartphone (S3) clarified that the phone was not able to receive the prompts when standing in a range distance of 7 metres. The prompting distance range was 1 metre. The prompt frequency was not consistent within this range (0 prompts per minute when standing still). With S3, the LBC-app had to be opened (and kept open) to be able to receive the prompts. No notifications were shown on S3, while notifications for the

LBC-app were allowed on the smartphone. The prompt frequency when keeping the LBC-app open was 1 prompt per minute when standing still. The LBC-app needed to be closed and re-opened to receive prompts. Prompting only occurred when standing right in front of the beacon. When walking by the beacon with S3 in a regular walking pace, the prompts were not received by the smartphone.

5. Discussion

The main purpose of this study was to investigate whether LBC encouraged employees to use the stairs, and if the prompts, as well as the possible changes in the use of stairs, affect the perceived stress level of employees.

5.1 Findings

Although all hypotheses from the theoretical framework were rejected, the main finding in this study was the unreliable performance of the LBC. Only two out of seventeen participants reported receiving the prompts. Therefore, no firm conclusions can be drawn from the analyses and is it most important to discuss the usability and feasibility of LBC and prompting to stimulate health behaviours.

The LBC-app control items scored low in each condition. Participants reported a high score on if they carried their smartphone with them every day, and thereby this could have not affected the exposure possibilities to the LBC. The scores of the items on; user friendliness of the LBC-app, if the prompts showed correctly on the participants' smartphone, and if the LBC-app worked well, cannot be interpreted, since most participants reported in the post-test that they had problems with receiving the prompts.

The additional prompt check after the intervention clarified that prompting was experienced differently on various smartphones. All smartphones used in the check did not receive the prompt when walking by the beacon in a regular walking pace. Participants would have to stand in front of or very close to the beacon in order to receive any prompt during the intervention. The check showed that the app needed to be re-opened sometimes to be able to receive the prompts. Furthermore, when the researcher was able to receive a notification on the test smartphone, no prompt content was shown in the LBC-app, or it was only shown after a few seconds after opening the LBC-app. These findings can give an indication of the differences between prompting in a test-situation and a real-life situation (e.g. during the intervention). Participants are not consciously aware of the fact that they have to re-open the app every time to be able to receive the prompts. Adding to that, participants were probably not walking in such a slow pace that prompts could be received by the smartphones of the participants, or were missing the content of the prompts after opening the LBC-app. In a real-life situation, most participants would have walked by the beacon before even noticing these prompts.

5.2 Theoretical Implication

In this research, the average perceived stress level score of participants was found low to neutral. While Central Bureau of Statistics Netherlands pointed out that high psychological work pressure is found in employees in the educational field (CBS, 2018b). An explanation for the low score of perceived stress level can be that the study sample was already quite physically active. The use of stairs was higher in participants located at the 2nd floor [CONT3], but nevertheless all participants reported that they quite frequently made use of the stairs at work. Engaging in PA has a positive influence on the mental health state (Penedo & Dahn, 2005), which can be applicable

to this study sample. The frequency of the use of stairs was self-reported. However, self-reported use of stairs can have differences when compared to objective use of stairs. A study which compared self-reported use of stairs and objective use of stairs, self-reported use of stairs was found twice as high (Engbers, van Poppel, & van Mechelen, 2007).

The main reason participants reported to use the stairs was related to health reasons, which is consistent with other literature where motivations to use the stairs was asked (Kerr, Eves, & Carroll, 2000, 2001). Reasons to not take the stairs included time efficiency, the habitual behaviour of taking the elevator, laziness, or social reasons (colleagues who take the elevator). Habitual behaviour often occurs when being triggered by an environment or specific cues, which happens mostly subconsciously (Hagger, 2018). Within this study sample, an example of a specific cue could be that participants are walking with soup or luggage. Another cue can be the normative influence of walking together with colleagues who take the elevator, which is an interesting reason that is reported by participants in this research as a reason to not take the stairs. Rather than focussing on the physical environment as discussed in the introduction, interfering with the social environment can be an option. Having social support is found to have association with increased physical activity (McNeill, Kreuter, & Subramanian, 2006). Relating to this study, colleagues who motivate each other to take the stairs could be a big influence in their actual use of stairs.

Åvitsland et al. (2017) found that in their study participants did not like the fact that the intervention was interfering with what they were already doing, which was using the stairs. Although most participants were already using the stairs most of the times, no negative feelings towards the LBC were found in this study. An explanation for this could be the limited exposure to the prompt content. This could possibly occur when the prompt frequency was higher. In a recent article, a similar research set-up as the present study was used. The effects of prompt content were studied, to see whether social prompts (normative messages) and non-social prompts (health related messages) had effect on the use of stairs in a university setting (Crozier, 2019). This research showed that social prompts have a greater influence to increase the use of stairs, than the non-social prompts. Similar effects of the study of Crozier (2019) might be the case in the present research, but therefore the prompts needed to be received by the participants, which did not happen.

5.3 Strengths and limitations

Before mentioning the strengths of this research, a critical note needs to be made. The strengths are written with the consideration that the prompts did not reach majority of the participants. Strengths of this research purely relate to the set-up of the study and its theoretical background.

Firstly, this research contributes to the knowledge of conducting research with the technology of LBC. When the LBC-app and beacons are used more frequently in research, more knowledge is gathered on how LBC works in a real-life situation.

Secondly, regarding the set-up of this research, namely the use of three different conditions, the content of the prompts was formulated in a normative, health beneficial, or neutral (control) form. Additionally, within this research, different prompt variations were set up within the three conditions. This can be considered a useful tool, to overcome repetition and habituation with the content of the prompts.

Thirdly, the research contains an additional prompt check after the intervention. This was done with the purpose of getting to know the problems with the beacons, smartphones and the LBC-app. Gathering information on the differences between the test situation and the real-life (intervention) situation is useful when unexpected drawbacks occurred during the study. Lastly, the measurement of perceived stress levels of employees was done by the PSQ. This was a reliable tool to measure the perceived stress levels of employees within this research.

The following limitations need to be taken into account when interpreting the results of this study. Firstly, the main limitation to this study is the non-exposure of the LBC (prompts) to the participants. The effects the three conditions with exposure to different prompt content, could thereby not be determined.

Secondly, even though the research had 31 participants at first, at the start of the research on January 14th, only 21 participants filled in the pre-test. This drop-out can partly be explained by illness of participants during the time of the study, and by participants who were only willing to participate in the study when they could use their own iPhone, and not another borrowed (Android) smartphone. The post-test was filled in by only 17 participants. This led to a low amount of data to make this a reliable quantitative study. The selected sample of participants also needs to be kept in mind. Because of the convenient sampling method in this study, self-selection bias can be present. Most participants already regularly engaged in healthy behaviour (e.g. use of stairs, walking during lunchtime), which could have affected the results. Different results could be found for employees who are not currently physically active, or have a lower PA level, comparing to 'active people'. For example, a study that made use of smartphone apps to influence PA, found that smartphone triggers to encourage PA behaviour were more effective in inactive people with low activity levels (Harries et al., 2016). Furthermore, participants of the present study were not randomly selected out of all WUR employees. This makes the sample not representative for all WUR employees, or university employees in general.

Thirdly, recall bias in the self-reported use of stairs could be present, since the participants had to recall their daily use of stairs in both the pre- and post-test. Besides that, the participants might have given socially desired answers to the self-reported use of stairs. Finally, the duration of the intervention and the time period of this study. The duration of the intervention of two weeks could be too short to influence the use of stairs and perceived stress level of participants. On top of that, it could be hard to see effects of the small changes in the participants' use of stairs on their perceived stress level. The time period (January) in which the intervention was conducted, could have influenced participants' use of stairs. January is known as the time of new year's resolutions, inciting a larger concern for health, such as starting weight loss and PA programs (Rössner, Hansen, & Rössner, 2011).

5.3 Recommendation future research

This research can have important contributions to the usage of LBC in (health promotion) research at the workplace. Further research into the topic of stress levels among Dutch employees is becoming more important every day, because of the increasingly physiological work pressure in the work environment (TNO, 2017).

Specific recommendations regarding future research with usage of beacons and the LBC-app is that the beacons need to be tested several times before usage, with various Android smartphones. This has to be done to see if, with the right smartphone settings, the beacons; prompt in the intervention area, prompt within the set range distance, and prompt frequently every day multiple times when walking by the beacon, without having to (re-)open the app. A pre-intervention test week can be implemented several weeks before the real study starts. Also, all the participants need to test if they can receive the prompts through a pre-intervention test. In-between 'check-ups' during the intervention is recommended, to see if the participants have received any prompts until that moment. Then, necessary adjustments can be made to the LBC technology or smartphones that are used in the intervention.

Within this study, no significant differences in the use of stairs and perceived stress level were found between the pre- and post-test. To test the effects of using the stairs on the perceived stress level, a larger study sample and a longer intervention period is recommended. Changing one's behaviour can be hard, since it takes time and energy to implement new behaviours (Goetzel & Pronk, 2010). A longer intervention period might be useful to get participants to actively change their behaviour. However, to participate in a WHPP for a longer period of time also costs energy and might be considered time consuming for some employees (Goetzel & Pronk, 2010). Even if the participants change their use of stairs, it is not guaranteed that the behaviours that are stimulated by the smartphone prompts will be continued in the long run, as seen in previous research (Bellicha et al., 2016).

Since this study contained many participants who were already actively using the stairs, a different study sample of employees can be addressed. Greater effects in the use of stairs in the pre- and post-test can then be achieved. The study population can also be changed into employees who have a high perceived stress level at baseline. Pre-intervention research can be done at first, to see which study population have a high perceived stress level score.

Addressing work-related stress is hard and takes much time to be solved (Seňová & Antošová, 2014). Walking the stairs, or doing other forms of PA might not directly take away the causes of stress, but possibly can help to reduce the symptoms (Penedo & Dahn, 2005). Therefore, it is important that future research investigates the influence and effect of PA on employees' stress levels.

5.4 Conclusion

To conclude, the findings of the present study provide first insight into the use of stairs at the Leeuwenborch, and perceived stress levels of employees. Due to little to non-exposure of the LBC in form of smartphone prompts occurred in this study. No conclusions can be drawn on the stimulating effect of normative and health messages on employees' use of stairs. Further research with use of beacons and the LBC-app is recommended, since it will augment the knowledge of the limited research on LBC. However, multiple (in-between) testing and check-ups on the performance of the technology should be incorporated prior and during the study.

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Appendix A – Beacons and smartphone prompts

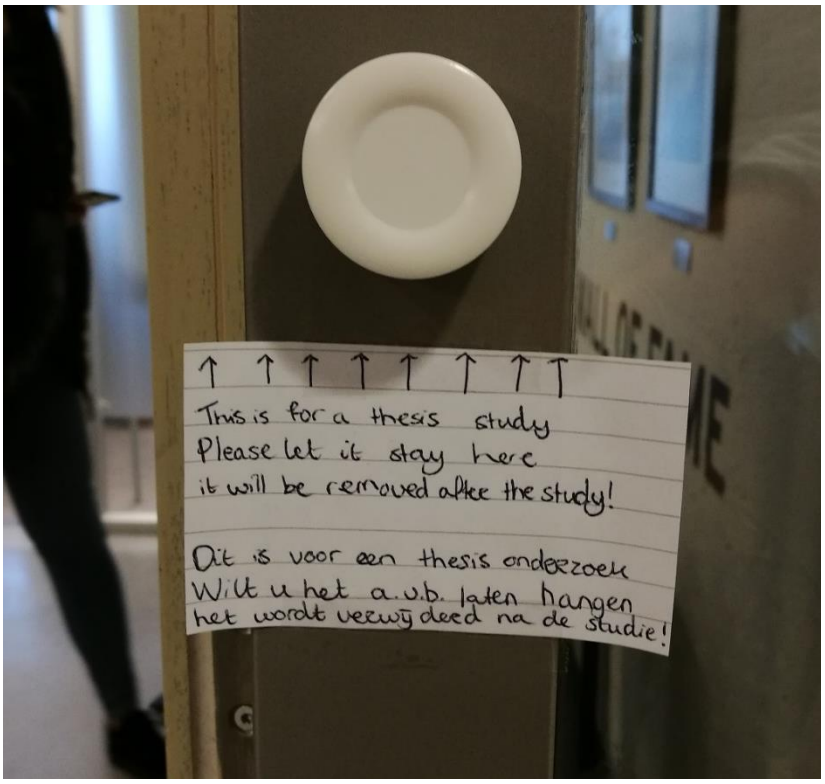

Figure 4. *Picture of beacon placed at floors 2, 3 and 4 in the Leeuwenborch during the intervention.*

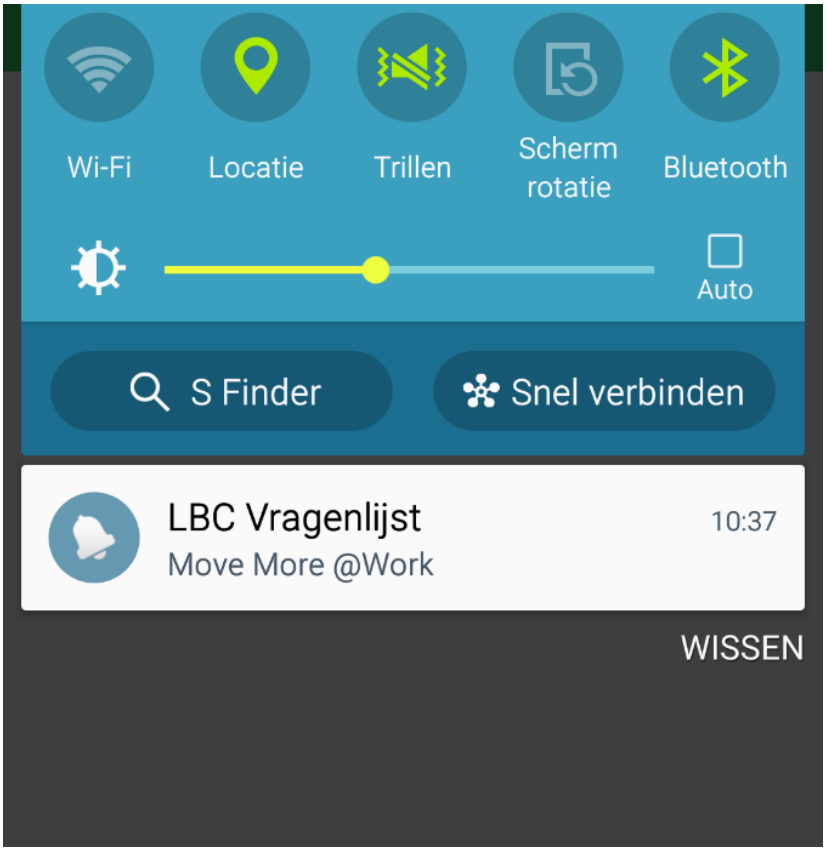

Figure 5. *Picture of notification on smartphone when prompt is received.*

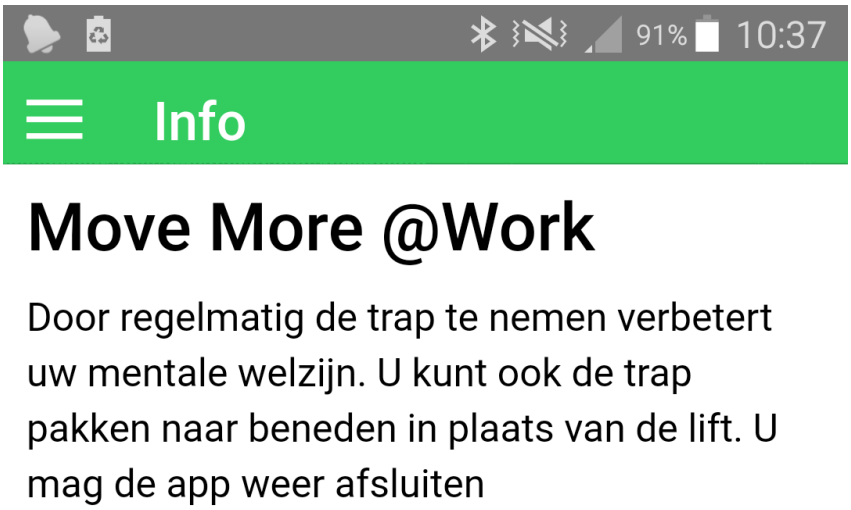

Figure 6. *Picture of the LBC-app when a notification is opened, displaying a prompt content example.*

Appendix B1 – Randomisation scheme

Table 7. *Randomisation scheme on which prompt content variation per intervention day was placed at each floor.*

Day	Normative condition (floor 3)	Health message condition (floor 4)	Control condition (floor 2)
Day 1 (14 January)	Prompt 2 (beacon 3)	Prompt 1 (beacon 9)	Prompt 2 (beacon 7)
Day 2 (15 January)	Prompt 3 (beacon 4)	Prompt 2 (beacon 5)	Prompt 2 (beacon 7)
Day 3 (16 January)	Prompt 1 (beacon 8)	Prompt 2 (beacon 5)	Prompt 1 (beacon 10)
Day 4 (17 January)	Prompt 2 (beacon 3)	Prompt 1 (beacon 9)	Prompt 3 (beacon 11)
Day 5 (18 January)	Prompt 2 (beacon 3)	Prompt 3 (beacon 6)	Prompt 2 (beacon 7)
Day 6 (19 January)	– no prompting -	– no prompting -	– no prompting -
Day 7 (20 January)	– no prompting -	– no prompting -	– no prompting -
Day 8 (21 January)	Prompt 3 (beacon 4)	Prompt 2 (beacon 5)	Prompt 1 (beacon 10)
Day 9 (22 January)	Prompt 1 (beacon 8)	Prompt 1 (beacon 9)	Prompt 1 (beacon 10)
Day 10 (23 January)	Prompt 2 (beacon 3)	Prompt 1 (beacon 9)	Prompt 3 (beacon 11)
Day 11 (24 January)	Prompt 1 (beacon 8)	Prompt 2 (beacon 5)	Prompt 2 (beacon 7)
Day 12 (25 January)	Prompt 2 (beacon 3)	Prompt 3 (beacon 6)	Prompt 1 (beacon 10)
Day 13 (26 January)	– no prompting -	– no prompting -	– no prompting -
Day 14 (27 January)	– no prompting -	– no prompting -	– no prompting -

Appendix B2 – Prompt content variation assignment

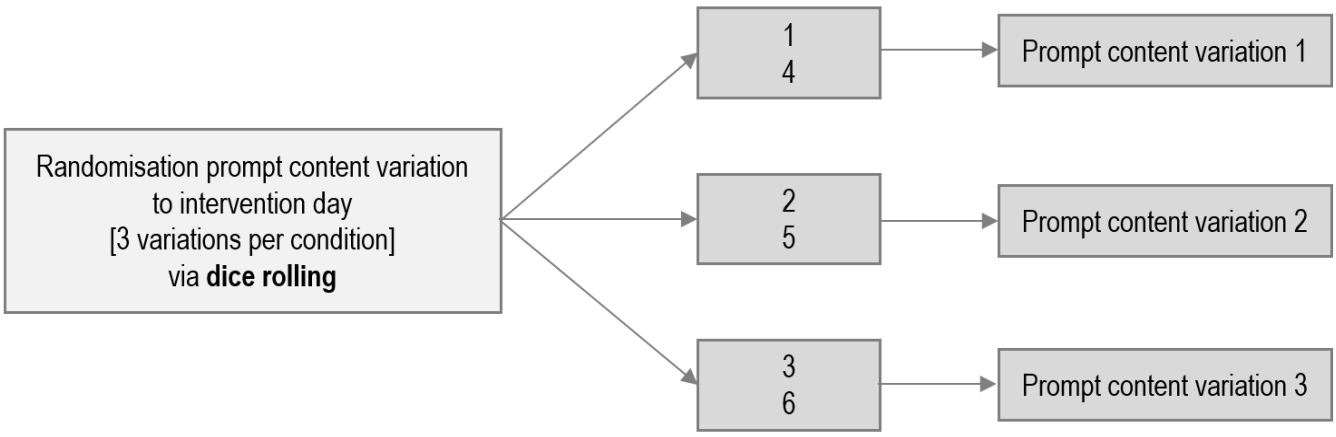

Figure 7. *Randomisation scheme for assignment prompt content variation to intervention day.*

Appendix C – Content smartphone prompts

Overview of the smartphone prompts send to the participants when walking or coming nearby the beacon.

The *normative* condition sent out one of the following prompts:

English:

1. "Almost 75% of the Dutch working population take the stairs going down instead of the elevator. You can also take the stairs instead of the elevator going down."
2. "Most WUR employees take the stairs going down. Do you also take the stairs instead of the elevator going down?"
3. "Employees who have an office job are more inclined to take the stairs going down. You can also take the stairs instead of the elevator going down."

Dutch:

1. "Bijna 75% van de Nederlandse werknemers pakken de trap naar beneden in plaats van de lift. U kunt ook de trap pakken naar beneden in plaats van de lift."
2. "De meeste WUR-werknemers nemen de trap naar beneden. Pakt u ook de trap naar beneden in plaats van de lift?"
3. "Werknemers met een zittend beroep zijn meer geneigd om de trap te pakken naar beneden. U kunt ook de trap pakken naar beneden in plaats van de lift."

The *health message* condition sent out one of the following prompts:

English:

1. "Taking the stairs instead of the elevator improves your total health status. To experience this health effect, you can take the stairs instead of the elevator to go down."
2. "Taking the stairs improves your physical fitness. Do you also take the stairs instead of the elevator going down?"
3. "Through taking the stairs regularly, your mental well-being improves. You can also take the stairs going down instead of the elevator."

Dutch:

1. "De trap pakken in plaats van de lift verbetert uw algemene gezondheid. U kunt ook de trap pakken naar beneden in plaats van de lift."
2. "De trap pakken in plaats van de lift verbetert uw conditie. Pakt u ook de trap naar beneden in plaats van de lift?"
3. "Door regelmatig de trap te nemen verbetert uw mentale welzijn. U kunt ook de trap pakken naar beneden in plaats van de lift."

The *control* condition sent out one of the following prompts:

English:

1. “Do you also take the stairs instead of the elevator going down today?”
2. “Instead of taking the elevator going down, you can also take the stairs down.”
3. “You could take the stairs going down, instead of taking the elevator.”

Dutch:

1. “Pakt u vandaag ook de trap naar beneden in plaats van de lift?”
2. “U kunt in plaats van met de lift naar beneden gaan ook via de trap naar beneden lopen.”
3. “U zou ook via de trap naar beneden kunnen lopen in plaats van met de lift naar beneden te gaan.”

Appendix D – Poster

Figure 8. *Poster placed at three floors in the WUR building Leeuwenborch.*

Appendix E1 – Questionnaire pre-test

Openingspagina

Van 14 januari t/m 25 januari neemt u deel aan het onderzoek voor een masterthesis aan de universiteit in Wageningen. Dit onderzoek heeft het doel om te kijken wat de invloed is van extra beweging door middel van traplopen, gestimuleerd via smartphone prompts, op het ervaren stressniveau van werknemers. U wordt verzocht tijdens dit onderzoek twee online vragenlijsten over uw beweging en ervaren stressniveau in te vullen (max. 10 minuten). Dit is de eerste vragenlijst. De tweede vragenlijst zult u ontvangen via uw e-mail aan het eind van het onderzoek. De antwoorden in de vragenlijst zijn van belang voor dit onderzoek. Hierin zijn geen goede of foute antwoorden mogelijk. Ik vertrouw op een eerlijke beantwoording van de vragen.

Gedurende de twee weken van het onderzoek ontvangt u een prompt op een te lenen of eigen smartphone, die u stimuleert om vaker de trap te nemen. Deze kleine toename in beweging op de werkvloer kan een positieve bijdrage leveren aan uw gezondheid en stressniveau.

Uw deelname aan dit onderzoek is volledig vrijwillig, en u heeft het recht om op elk moment uw deelname te beëindigen. U hoeft geen reden te geven voor uw beëindiging van deelname. Daarnaast is uw deelname anoniem, geen enkele respondent kan worden geïdentificeerd. De data die verzameld wordt uit deze vragenlijst zal ook op groepsniveau worden geanalyseerd. Deze data zal uitsluitend voor dit onderzoek worden gebruikt.

Hieronder kunt u aangeven dat u deze informatie heeft gelezen, en dat u toestemt om mee te doen aan het onderzoek onder de voorwaarden zoals hierboven beschreven. Mochten er nog vragen of opmerkingen zijn met betrekking tot het onderzoek, of deze vragenlijst, dan kunt u contact opnemen met Claire Grootveld door te mailen naar claire.grootveld@wur.nl

Ik wil u graag alvast hartelijk bedanken voor uw deelname aan dit onderzoek als onderdeel van mijn master thesis. Uw deelname wordt gewaardeerd. U kunt doorklikken op het pijltje rechtsonder om te starten met de vragenlijst.

Claire Grootveld
MSc Student Communication, Health and Life Sciences (Health & Society)

- o Ja, ik stem toe de informatie te hebben gelezen en deel te nemen aan het onderzoek
- o Nee, ik stem niet toe deel te nemen aan het onderzoek

1. Demografische gegevens

1.1 Gender

Met welke omschrijving identificeert u zich?

- Man
- Vrouw
- Geen / Neutraal

1.2 Leeftijd

Wat is uw leeftijd?

_____

1.3 Opleidingsniveau

Wat is uw hoogst genoten opleidingsniveau?

- Basisonderwijs
- Mavo / Vbo
- Havo / Vwo
- Mbo
- Hbo
- Wo

1.3 *Fysieke belemmering*

Heeft u een eventuele fysieke belemmering wat traplopen lastig(er) maakt?

- Ja, _____
- Nee, ik kan de trap op- en af lopen
- Hier geef ik liever geen antwoord op

1.4 Afdeling Leeuwenborch

Op welke afdeling werkt u in de Leeuwenborch?

- Verdieping 2
- Verdieping 3
- Verdieping 4

2. Traplopen

2.1 Reden wel traplopen

Wat is de belangrijkste reden waarom u **wel** de trap pakt op uw werk?

- Gezondheid
- Sport / Training
- Efficiënter qua tijd
- Gewoonte
- Anders: _____
- Ik pak nooit de trap op werk

2.2 Reden niet traplopen

Wat is de belangrijkste reden waarom u **niet** de trap pakt op uw werk?

- Fysiek niet mogelijk
- Efficiënter qua tijd
- Gewoonte
- Anders: _____
- Ik pak altijd de trap op werk

2.3 Bereidheid traplopen (aantal verdiepingen)

Hoe veel verdiepingen bent u **in het algemeen** bereid om naar beneden te lopen met de trap, voordat u besluit om de lift te pakken?

- 1 verdiepingen
- 2 verdiepingen
- 3 verdiepingen
- 4 verdiepingen
- 5 verdiepingen
- 6 of meer verdiepingen

2.4 Frequentie traplopen

Bij het beantwoorden van de volgende twee vragen, denkt u dan aan hoe vaak u de trap heeft gepakt in de **afgelopen 2 werkweken** (eventueel voor uw vakantie).

Hoe vaak pakt u gemiddeld per dag de trap **naar beneden** in de Leeuwenborch?

- Nooit
- 1 à 2 keer per dag
- 3 à 4 keer per dag
- 5 à 6 keer per dag
- 7 à 8 keer per dag

- 9 keer of meer per dag

Hoe vaak pakt u gemiddeld per dag de trap **naar boven** in de Leeuwenborch**?**

- Nooit
- 1 à 2 keer per dag
- 3 à 4 keer per dag
- 5 à 6 keer per dag
- 7 à 8 keer per dag
- 9 keer of meer per dag

3. Perceived Stress Questionnaire (Fliege et al., 2005)

Hieronder volgen 20 stellingen. De slider kunt u verschuiven naar elke plaats tussen 0 (nooit) en 1 (altijd). Verschuif de slider naar het punt dat het beste aansluit bij hoe vaak **gedurende de afgelopen 4 weken** de stelling voor u gelde. Probeer niet te lang over uw antwoorden na te denken.

"Zorgen"

Item 1.	Ik ben bang voor de toekomst	0 _____ 1
Item 2.	Ik maak mij vaak zorgen	0 _____ 1
Item 3.	Ik heb het idee dat mijn problemen zich opstapelen	0 _____ 1
Item 4.	Ik ben bang dat het mij niet lukt mijn doelen te bereiken	0 _____ 1
Item 5.	Ik voel mij gefrustreerd	0 _____ 1

"Spanning"

Item 6.	Ik voel mij gespannen	0 _____ 1
Item 7.	Ik voel mij uitgerust	0 _____ 1
Item 8.	Ik voel mij mentaal uitgeput	0 _____ 1
Item 9.	Ik heb moeite om mij te ontspannen	0 _____ 1
Item 10.	Ik voel mij kalm	0 _____ 1

"Blijheid"

Item 11.	Ik doe dingen die ik daadwerkelijk leuk vind	0 _____ 1
Item 12.	Ik vermaak mijzelf	0 _____ 1
Item 13.	Ik ben zorgeloos	0 _____ 1
Item 14.	Ik zit vol met energie	0 _____ 1
Item 15.	Ik voel mij veilig en beschermd	0 _____ 1

"Eisen"

Item 16.	Ik heb te veel dingen die ik moet doen	0 _____ 1
Item 17.	Ik heb genoeg tijd voor mijzelf	0 _____ 1
Item 18.	Ik voel mij onder druk staan door deadlines	0 _____ 1
Item 19.	Ik voel mij gehaast	0 _____ 1
Item 20.	Ik voel dat er teveel van mij gevraagd wordt	0 _____ 1

4. Overige opmerkingen

Mocht u verder nog iets kwijt willen over de vragenlijst of over het onderzoek, dan kunt u hieronder een opmerking achterlaten.

Afsluitende pagina

Ik wil u nogmaals hartelijk danken voor de deelname aan dit onderzoek. Mocht u nog vragen hebben betreffende het onderzoek of deze vragenlijst, dan kunt u mij bereiken op: claire.grootveld@wur.nl

Appendix E2 – Questionnaire post-test

Openingspagina

Van 14 januari t/m 25 januari neemt u deel aan het onderzoek voor een masterthesis aan de universiteit in Wageningen. Dit onderzoek heeft het doel om te kijken wat de invloed is van extra beweging door middel van traplopen, gestimuleerd via smartphone prompts, op het ervaren stressniveau van werknemers.

U wordt verzocht tijdens dit onderzoek twee online vragenlijsten over uw beweging en ervaren stressniveau in te vullen (max. 10 minuten). Dit is de tweede, en tevens afsluitende vragenlijst van het onderzoek.

Mochten er nog vragen of opmerkingen zijn met betrekking tot het onderzoek, of deze vragenlijst, dan kunt u contact opnemen met Claire Grootveld door te mailen naar claire.grootveld@wur.nl

Ik wil u graag alvast hartelijk bedanken voor uw deelname aan dit onderzoek als onderdeel van mijn master thesis. Uw deelname wordt gewaardeerd.

U kunt doorklikken op het pijltje rechtsonder om te starten met de vragenlijst.

Claire Grootveld
MSc Student Communication, Health and Life Sciences (Health & Society)

1. Demografische gegevens

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Met welke omschrijving identificeert u zich?

- Man
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- Geen / Neutraal

1.2 Leeftijd

Wat is uw leeftijd?

_____

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Wat is uw hoogst genoten opleidingsniveau?

- Basisonderwijs
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1.3 *Fysieke belemmering*

Heeft u een eventuele fysieke belemmering wat traplopen lastig(er) maakt?

- Ja, _____
- Nee, ik kan de trap op- en af lopen
- Hier geef ik liever geen antwoord op

1.4 Afdeling Leeuwenborch

Op welke afdeling werkt u in de Leeuwenborch?

- Verdieping 2
- Verdieping 3
- Verdieping 4

2. Traplopen

2.1 Reden wel traplopen

Wat is de belangrijkste reden waarom u **wel** de trap pakt op uw werk?

- Gezondheid
- Sport / Training
- Efficiënter qua tijd
- Gewoonte
- Anders: _____
- Ik pak nooit de trap op werk

2.2 Reden niet traplopen

Wat is de belangrijkste reden waarom u **niet** de trap pakt op uw werk?

- Fysiek niet mogelijk
- Efficiënter qua tijd
- Gewoonte
- Anders: _____
- Ik pak altijd de trap op werk

2.3 Bereidheid traplopen (aantal verdiepingen)

Hoe veel verdiepingen bent u in het algemeen bereid om naar beneden te lopen met de trap, voordat u besluit om de lift te pakken?

- 1 verdiepingen
- 2 verdiepingen
- 3 verdiepingen
- 4 verdiepingen
- 5 verdiepingen
- 6 of meer verdiepingen

2.4 Frequentie traplopen

Bij het beantwoorden van de volgende twee vragen, denkt u dan aan hoe vaak u de trap heeft gepakt in de **afgelopen 2 weken**.

Hoe vaak pakt u gemiddeld per dag de trap **naar beneden** in de Leeuwenborch?

- Nooit
- 1 à 2 keer per dag
- 3 à 4 keer per dag
- 5 à 6 keer per dag
- 7 à 8 keer per dag

- 9 keer of meer per dag

Hoe vaak pakt u gemiddeld per dag de trap **naar boven** in de Leeuwenborch**?**

- Nooit
- 1 à 2 keer per dag
- 3 à 4 keer per dag
- 5 à 6 keer per dag
- 7 à 8 keer per dag
- 9 keer of meer per dag

3. Perceived Stress Questionnaire (Fliege et al., 2005)

Hieronder volgen 20 stellingen. De slider kunt u verschuiven naar elke plaats tussen 0 (nooit) en 1 (altijd). Verschuif de slider naar het punt dat het beste aansluit bij hoe vaak **gedurende de afgelopen 4 weken** de stelling voor u gelde. Probeer niet te lang over uw antwoorden na te denken.

"Zorgen"

Item 1.	Ik ben bang voor de toekomst	0 _____ 1
Item 2.	Ik maak mij vaak zorgen	0 _____ 1
Item 3.	Ik heb het idee dat mijn problemen zich opstapelen	0 _____ 1
Item 4.	Ik ben bang dat het mij niet lukt mijn doelen te bereiken	0 _____ 1
Item 5.	Ik voel mij gefrustreerd	0 _____ 1

"Spanning"

Item 6.	Ik voel mij gespannen	0 _____ 1
Item 7.	Ik voel mij uitgerust (pos)	0 _____ 1
Item 8.	Ik voel mij mentaal uitgeput	0 _____ 1
Item 9.	Ik heb moeite om mij te ontspannen	0 _____ 1
Item 10.	Ik voel mij kalm (pos)	0 _____ 1

"Blijheid"

Item 11.	Ik doe dingen die ik daadwerkelijk leuk vind	0 _____ 1
Item 12.	Ik vermaak mijzelf	0 _____ 1
Item 13.	Ik ben zorgeloos	0 _____ 1
Item 14.	Ik zit vol met energie	0 _____ 1
Item 15.	Ik voel mij veilig en beschermd	0 _____ 1

"Eisen"

Item 16.	Ik heb te veel dingen die ik moet doen	0 _____ 1
Item 17.	Ik heb genoeg tijd voor mijzelf (pos)	0 _____ 1
Item 18.	Ik voel mij onder druk staan door deadlines	0 _____ 1
Item 19.	Ik voel mij gehaast	0 _____ 1
Item 20.	Ik voel dat er teveel van mij gevraagd wordt	0 _____ 1

4. Smartphone prompts

Gedurende de twee weken van het onderzoek heeft u een prompt ontvangen op een geleende of uw eigen telefoon, die u stimuleerde om vaker de trap te nemen. De volgende vragen gaan over deze prompts en bijbehorende LBC-app.

4.1 Prompts

Hoeveel dagen van 14 januari t/m 25 januari bent u aanwezig geweest **op uw verdieping op de Leeuwenborch**? U kunt de slider verschuiven naar het aantal dagen tussen 0 en 10 (e.g. alle dagen aanwezig geweest = 10 werkdagen).

Aantal dagen aanwezig geweest tussen 14 – 25 januari 0 _____ 10

Heeft u elke dag dat u **aanwezig was op uw verdieping op de Leeuwenborch** een smartphone prompt gekregen?

- o Ja, ik heb elke dag dat ik aanwezig was een prompt gekregen
- o Nee, ik heb niet elke dag dat ik aanwezig was een prompt gekregen

Zo ja, hoe vaak heeft u dagelijks een smartphone prompt gekregen?

- o 0 keer per dag
- o 1 à 2 keer per dag
- o 3 à 4 keer per dag
- o 5 of meer keer per dag

Welk(e) smartphone prompt(s) heeft u gekregen tijdens het onderzoek? Meerdere antwoorden zijn mogelijk.

- "Bijna 75% van de Nederlandse werknemers pakken de trap naar beneden in plaats van de lift. U kunt ook de trap pakken naar beneden in plaats van de lift."
- "De meeste WUR-werknemers nemen de trap naar beneden. Pakt u ook de trap naar beneden in plaats van de lift?"
- "Werknemers met een zittend beroep zijn meer geneigd om de trap te pakken naar beneden. U kunt ook de trap pakken naar beneden in plaats van de lift."
- "De trap pakken in plaats van de lift verbetert uw algemene gezondheid. U kunt ook de trap pakken naar beneden in plaats van de lift."
- "De trap pakken in plaats van de lift verbetert uw conditie. Pakt u ook de trap naar beneden in plaats van de lift?"
- "Door regelmatig de trap te nemen verbetert uw mentale welzijn. U kunt ook de trap pakken naar beneden in plaats van de lift."
- "Pakt u vandaag ook de trap naar beneden in plaats van de lift?"
- "U kunt in plaats van met de lift naar beneden gaan ook via de trap naar beneden lopen."
- "U zou ook via de trap naar beneden kunnen lopen in plaats van met de lift naar beneden te gaan."
- Geen van bovenstaande

4.2 Ervaren invloed prompts op frequentie traplopen

Heeft u het idee dat de frequentie van de trap pakken **in de afgelopen 2 werkweken** is veranderd (door de smartphone prompts)?

- o Ja, Verhoogd
- o Nee, Verlaagd
- o Nee, Hetzelfde gebleven

Hoe hebben de smartphone prompts u beïnvloed? Hieronder staan meerdere statements waar u één of meerdere van kunt aanvinken.

- Ik neem altijd al de trap, dus de smartphone prompts hebben mij niet beïnvloed
- Ik ben bewuster geworden over hoe vaak ik de trap pak
- Ik ben niet beïnvloed door de smartphone prompts
- Ik gebruik altijd de lift, ondanks de smartphone prompts
- Ik vond de smartphone prompts vervelend
- Anders: _____

4.3 LBC-app

De volgende 6 statements gaan over uw ervaring met het gebruik van de LBC-app. U kunt de slider verschuiven naar het punt dat het beste aansluit bij uw mening over de stelling. 0 komt overeen met 'helemaal niet mee eens' tot 1 dat 'helemaal mee eens' betekend.

1. De LBC-app was gebruiksvriendelijk. 0 _____ 1
2. De frequentie van de prompts was te veel. (neg) 0 _____ 1
3. De prompts kwamen niet duidelijk in beeld op de smartphone. (neg) 0 _____ 1
4. De smartphone droeg ik elke dag bij mij. 0 _____ 1
5. De LBC-app werkte goed. 0 _____ 1
6. De inhoud van de prompt was te begrijpen. 0 _____ 1

Heeft u nog andere opmerkingen over het gebruik van de LBC-app?

_____

5. Overige opmerkingen

Mocht u verder nog iets kwijt willen over de vragenlijst of over het onderzoek, dan kunt u hieronder een opmerking achterlaten.

_____

Afsluitende pagina

Ik wil u nogmaals hartelijk danken voor de deelname aan dit onderzoek. Mocht u nog vragen hebben betreffende het onderzoek of deze vragenlijst, dan kunt u mij bereiken op: claire.grootveld@wur.nl

Appendix F – Perceived Stress Questionnaire (English)

English version of the Perceived Stress Questionnaire by Fliege et al. (2005)

Scale: "Worries"

Item 1.	You are afraid for the future	0 _____ 1
Item 2.	You have many worries	0 _____ 1
Item 3.	Your problems seem to be piling up	0 _____ 1
Item 4.	You fear you may not manage to attain your goals	0 _____ 1
Item 5.	You feel frustrated	0 _____ 1

Scale: "Tension"

Item 6.	You feel tense	0 _____ 1
Item 7.	You feel rested	0 _____ 1
Item 8.	You feel mentally exhausted	0 _____ 1
Item 9.	You have trouble relaxing	0 _____ 1
Item 10.	You feel calm	0 _____ 1

Scale: "Joy"

Item 11.	You feel you are doing things you really like	0 _____ 1
Item 12.	You enjoy yourself	0 _____ 1
Item 13.	You are light hearted	0 _____ 1
Item 14.	You are full of energy	0 _____ 1
Item 15.	You feel safe and protected	0 _____ 1

Scale: "Demands"

Item 16.	You have too many things to do	0 _____ 1
Item 17.	You have enough time for yourself	0 _____ 1
Item 18.	You feel under pressure from deadlines	0 _____ 1
Item 19.	You feel you are in a hurry	0 _____ 1
Item 20.	You feel that too many demands are being made on you	0 _____ 1

Appendix G – Post-intervention testing

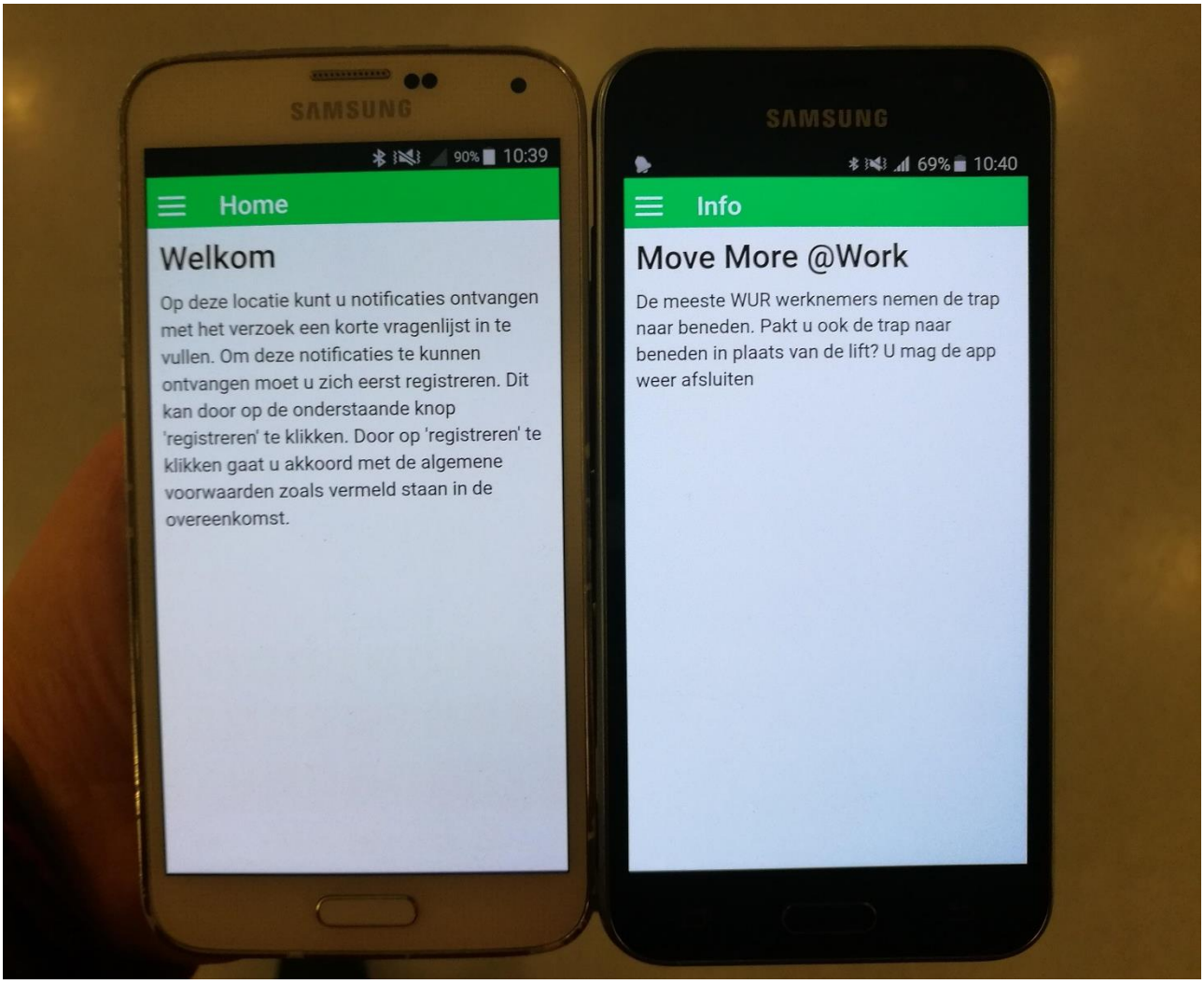

Figure 9. *The smartphone on the left did not receive the prompt and the smartphone on the right did receive the prompt, while standing in the 7 metres range distance.*