Exploring the possibility of pro-environmental nudging by fine-tuning the stairs versus elevator nudge.

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This study focused on the question whether nudging could be used as a tool to elicit pro-environmental behaviour in a context where people have to choose between taking the stairs and taking the elevator. Stair use was stimulated by a combination of green footprints on the floor, leading to the stairwell, and posters with salient injunctive norms accompanied by stair-use-stimulating messages in the elevator and stairwell area. The main findings showed a significant and stable increase (6.3-8.7%) in stair use when comparing the pre-intervention period with the 4-week intervention period. An expected moderating group effect was not found. Although the increase in stair use was significant, it did not lead to a decrease in the number of elevators per person, which implies that no energy was saved by this intervention. The tested nudges are, however, a cheap and reasonably efficient tool for health-promotion.

Anthropogenic greenhouse gas emissions are the main cause of the current global warming and its accompanying problems (IPCC, 2014). Although there is growing awareness that people's lifestyles need to become more sustainable in order to prevent further decline of the natural environment, the actual change towards pro-environmental behaviour seems to be rather difficult. In my research I have looked into the possible effectiveness of using *nudging* as a technique to close the gap between the awareness of the need for pro-environmental behaviour and the actual realization of this behaviour.

Carrying out pro-environmental behaviour is a choice people have to make and when people make choices, which they have to do an awful lot of times each day, it is never in a blank, neutral environment. Every detail in the environment is capable of slightly influencing what a person ends up deciding. In other words, people are always influenced by the way in which choices are framed, by choice architecture (Thaler & Sunstein, 2009). The reason for this can be found in the functioning of the human mind. It is argued that people generally could be seen as having two systems of thinking, system 1 and system 2 (Kahneman, 2012). System 1 is an automatic system that works in an instinctive, uncontrolled, effortless,

associative, fast, unconscious, skill-based way and makes use of a vast arsenal of heuristics and rules of thumb. System 2 is a reflective system that works in a controlled, effortful, deductive, slow, self-aware and rule-following way. In our complex world, it is simply not doable to use our slow, reflective system in every choice we are making. There is neither enough time nor enough cognitive capacity. Thus, to keep choices manageable, we often engage our system 1 (Kahneman, 2012; Thaler & Sunstein, 2009). However, its automatic, fast and unreflective nature makes system 1 susceptible to all kinds of random or deliberate influences in the choice environment. As a result, people often make (rationally) suboptimal choices.

Nudging uses the human sensitivity for choice architecture to try to steer people towards beneficial ends like healthy or pro-environmental behaviour. Following Thaler and Sunstein's definition a nudge is "any aspect of the choice architecture that alters people's behavior in a predictable way without forbidding any options or significantly changing their economic incentives. To count as a mere nudge, the intervention must be easy and cheap to avoid. Nudges are not mandates" (Thaler & Sunstein, 2009, p. 6). Nudging can be seen as a friendly way to help people make better choices. Its non-coercive nature leaves people's freedom and autonomy intact. Therefore, if it works properly, it would presumably be a better alternative than installing rules and prohibitions for pro-environmental ends.

Although there are some general principles that could be used to design effective nudges (see e.g. Thaler & Sustein, 2009), every choice situation needs its own specific, fine-tuned nudge. This fine-tuning is mostly just a matter of trial and error. The environmental behaviour I will focus on in this research is choosing between taking the stairs and taking the elevator. Elevators constitute an important part (up to 25 percent) in the energy consumption of large buildings (Sachs, 2005; Liu, Qiao & Chang, 2010). When a considerable amount of people could be persuaded to take the stairs instead of the elevator, a lot of energy could be saved.

For most people, stair use is a regularly repeated behaviour that takes place in a fairly unchanging context. When behaviour has these two characteristics it is likely to become more and more automatic and less and less in need of conscious thought; it becomes habitual (Verplanken & Aarts, 1999). So when we have to choose between taking the stairs and taking the elevator we usually use our quick and automatic system 1, which gets a lot of its input from contextual cues (Verplanken & Wood, 2006; Van Nieuw-Amerongen et al., 2011; Bargh & Gollwitzer, 1994). This makes stair use a perfect target for nudging. Changing the contextual cues – the choice architecture – might break the automatic link between goal and

behaviour (Sheeran et al., 2005).

There is a considerable body of research in the stair use context. One thing that has been tested several times in the past is the use of posters/signs with prompts and/or information that should stimulate stair use over elevator use. A review article by Eves and Webb (2006) shows that this manipulation alone is often rather ineffective. Although some small positive effects have been reported, stair ascend in particular seems to be minimally effected by poster/prompt interventions alone. However, if other manipulations are added to these interventions, results are more promising. A study by Van Nieuw-Amerongen et al. (2011), showed an increase in stair use of 8,2% after using prompts in combination with an improved accessibility, visibility and aesthetic quality of the stairwell. When comparing it with a study by Boutelle et al. (2001), where signs were only combined with the improvement of aesthetic quality and the addition of music leading to a 4,4% increase in stair use, it seems that especially the improvement of accessibility can have serious effects on stair use. Related to this are the findings of Rogers et al. (2010), who studied the effects of using a dynamic light system that 'guided' people towards the stairwell in combination with a feedback system that showed the amount of people taking the stairs versus the amount of people taking the elevator. This intervention resulted in an 8% increase in stair use.

In the study by Van Nieuw-Amerongen et al. (2011) accessibility was physically improved by leaving some doors leading to the stairwell permanently open and visually by replacing other wooden doors by glass doors and placing orange footprints leading to the stairwell on the floor. In the intervention of Rogers et al. (2010) accessibility was only visually improved by showing the possibility to take the stairs, using twinkly lights. Now, what both interventions have in common is that they try to change the perceived affordances of the choice situation, either visual (glass doors, twinkly lights, orange footprints), or physical (removing doors). We talk about a perceived affordance when a user sees a possibility for action in an object or environment (Norman, 1988). In a lot of (office) buildings, the elevators are both physically and visually more accessible than the stairwell. Furthermore, as mentioned before, stair use is usually a habitual behaviour, which means that the visual cues of a situation elicit a particular behaviour, which is then executed without too much reflection. So when people enter a building and need to go up, it is likely that most of them instantly perceive the affordance of taking the elevator, on which they then act. Both Van Nieuw-Amerongen et al. (2011) and Rogers et al. (2010) have brought the affordance of taking the stairs back into people's minds by improving salience and accessibility, which resulted in a slight improvement of stair use.

Most of the studies on stair use, including the above, have the initial goal of improving people's health by stimulating them to take the stairs. Where 8% is a nice outcome for health promotion, since it causes 8% of the people to live a slightly healthier life, it is rather useless in the context of pro-environmental behaviour. An 8% increase in people using the staircase will not significantly reduce the energy consumed by elevators. Therefore, if nudging is to be useful in this context, the percentage needs to go up. In this study I have tried to accomplish this by testing a variant of a visibility enhancing, stair-use-affordance stimulating manipulation in combination with a slightly differently designed stair-use-stimulating poster.

Both the intervention of Van Nieuw-Amerongen et al. (2011) and Rogers et al. (2010) were rather expensive. In the first case new glass doors were installed, the ventilation system was adjusted, the walls of the staircase were repainted and the staircase was recarpeted. In the second case a complicated dynamic system of lights was designed and developed, among other things. Might there be something simpler and cheaper that can achieve similar or preferably even much better results?

There might be. In a study initiated by the Danish company *iNudgeyou* littering behaviour was targeted by using green footprint stickers that led people towards trash bins (Aarestrup, 2012). A 46% decrease in targeted litter behaviour was found. The idea behind this nudge is that the green footprints make trash bins more salient, which makes them easier to find. Furthermore, in the western world green is generally associated with good, health, nature, sustainability, etcetera, so green footprints give a cue that throwing your garbage in the trash bin is a good thing to do. Likewise, placing green footprints in a stair use context is likely to convey the message that stair use is good (for health, for the environment). Van Nieuw-Amerongen et al. (2011) used orange footprints in their study. It is plausible that making them green can significantly increase the likelihood it influences people, for the reasons just discussed. Another detail that can significantly influence the effect is the exact way in which the footprints are placed on the floor, which will be further discussed in the method section. It is not yet clear whether the green footprints can actually have a similar effect in other contexts than the litter context, but it is worth finding out. Green footprint stickers are relatively cheap and the combination of making the stairwell entrance more visible/salient and implicitly giving people a reason for taking the stairs by the green colour make them good candidates for persuading people to take the stairs.

Although green footprints have the potential to implicitly bring people's attention to a reason for taking the stairs, posters can do this in a more clear and explicit way. In order to stimulate people to perform a particular behaviour, the message on the poster should be very

carefully designed. Most of the previous stair-use related poster interventions only conveyed messages that focus on giving good – mostly health related – reasons for taking the stairs. To the best of my knowledge, no research exists that proofs that a health related message would work better than an environmental related message or vice versa. Since this study relates to the environmental benefits of stair use it is appropriate to convey an environmental related message.

Given the convincing proof that salient social norms can greatly influence the way people behave (e.g. Cialdini, Reno & Kallgren, 1990), it seems logical to add messages that convey social norms on posters. There are basically two types of social norms, descriptive and injunctive norms. Descriptive social norms refer to what other people usually do in a similar situation, injunctive social norms refer to which choice is (morally) approved and ought to be made (Cialdini, Reno & Kallgren, 1990). In situations where the targeted 'bad' behaviour has a very high prevalence, as is the case with taking the elevator, it is unwise to use descriptive norms (Cialdini, 2003; Cialdini et al., 2006). The message 'most people use the stairs in this building' would be very unrealistic and unconvincing and the message 'a lot of people take the elevator in this building, which consumes a lot of energy, which is bad for the environment: please take the stairs' is likely to stimulate even more people to take the elevator since the descriptive norm says it is what most people do. Therefore, the only plausible option for adding a social-normative message is the use of an injunctive social norm. A subtle and simple way to convey an injunctive normative message is by using emoticons. Schultz et al. (2007) did this in the context of household energy consumption. People whose energy consumption was less than average received a positive emoticon, people whose energy consumption was above average received a negative emoticon. The results showed that the people in the first group kept their energy consumption at the same level and the people in the second group lowered their energy consumption.

Based on the literature review and considerations mentioned above I expected that:

H1: Significantly more people would use the stairs in a situation where a combination of (1) salience-enhancing green footprints and (2) posters conveying environmental related messages supported by injunctive social norms are present, compared to the base-line situation where no intervention is present.

To get some insight in the exact functioning of the nudge, a number of other variables were considered. First, in order to be able to conclude that a nudge has or has not had an effect, it is

important to look at the effect over a longer period of time. If the nudge would only have an effect in the first week of implementation and would gradually decline afterwards, it would not be truly effective. Given the stability of the effect over time in the research by Van Nieuw-Amerongen et al. (2011) in a similar setting, it was expected that:

H1a: The expected positive effect described in H1 would be stable over time.

Pro-environmental behaviour could be seen as ethical behaviour. Research in an organizational context has shown that the presence of peers, peer perceptions and the frequency of contact with peers generally play a key role in ethical decision making and ethical behaviour of an individual (Izraeli, 1988; McCabe & Trevino, 1993; Zey-Ferrell & Ferrell, 1982; Zey-Ferrell et al., 1979). Peers can both positively and negatively influence behaviour. On the one hand, the presence of peers increases the chance that someone feels watched and/or considers the impact an unethical action might have on their reputation. On the other hand, if your peers choose the unethical action – in the case of this study taking the elevator – it is more likely that you will follow, since it was found that perceptions of peer behaviour are generally better predictors of unethical behaviour than one's own wants and beliefs (Brass, Butterfield & Skaggs, 1998). More recent research by Lee (2010) suggests that peer influence is indeed also a key influence in the context of pro-environmental behaviour. Considering the above, it was expected that:

H1b: There would be a moderating group/peer effect on the size and direction of the expected effect described in H1.

Conscious perception of the nudge, conscious/unconscious decision-making after seeing the nudge and possible changes in future intentions were also regarded to find out some additional details of the workings of the nudge.

Method

Participants and setting

Participants were people that entered the Willem C. van Unnik building in Utrecht through the main entrance and subsequently either took the stairs or the elevator to get to higher levels of the building. The group of participants consisted of students and employees of the faculties of science, geosciences and social and behavioural sciences of Utrecht

University, other employees with supportive functions at Utrecht University, and occasional visitors of the building. The age of the participants ranged from the late-teens to the early 70s, with most participants being under the age of 30. During the five weeks of research, the number of participants varied from 1661 to 2471 (table 1) as a result of a fluctuating occupancy rate of the building's facilities. Another group of participants (n=109) filled in questionnaires.

Table 1.

Number of participants per period.

Period	N
Pre-intervention week	2471
1st intervention week	2347
2nd intervention week	1757
3rd intervention week	1661
4th intervention week	2072

The intervention site was the Willem C. van Unnik building. This building has 22 storeys of which the first 11 are in active use. Figure 1 shows a schematic map of the relevant features of the intervention site. As can be seen, it takes less effort to enter the elevator area than to enter the stairwell. For entering the stairwell two doors need to be opened, for entering the elevator area no effort, apart from walking, is required. This makes it more likely that the perceived affordance in this situation is 'to take the elevator' than 'to take the stairs'.

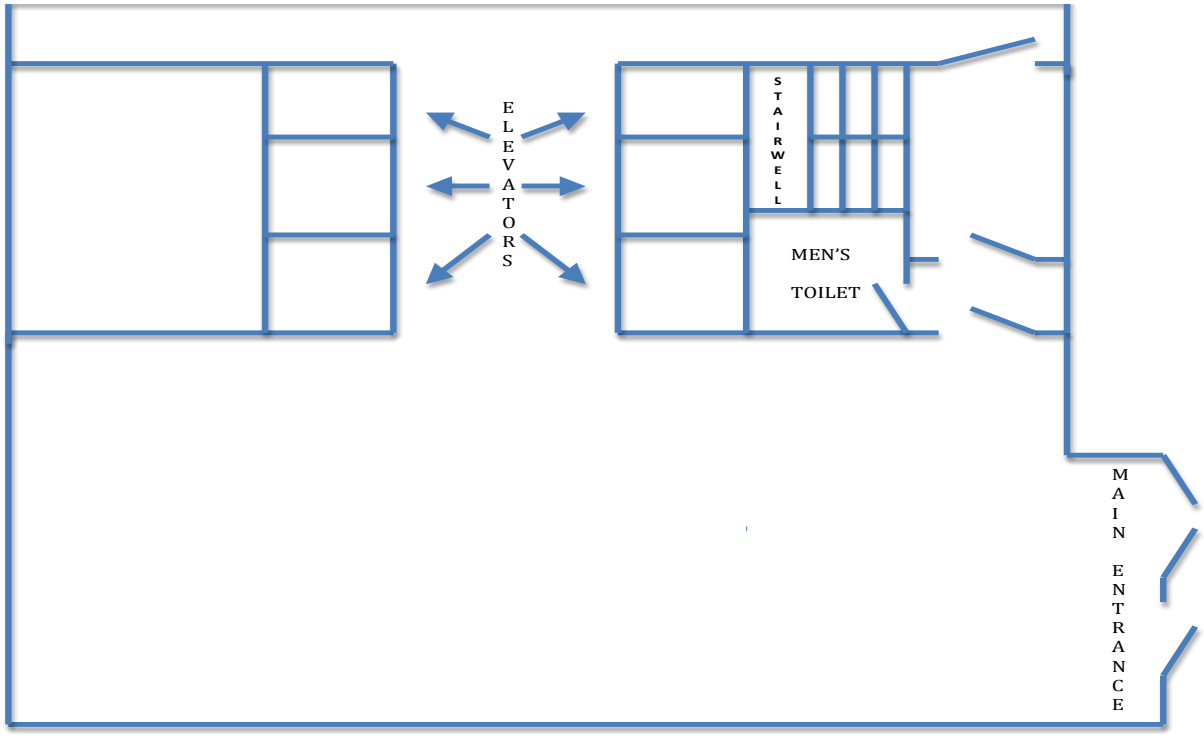

Figure 1. Schematic map of the research-relevant features of the intervention site – the Willem C. van Unnik building. When people enter the building via the main entrance both the entrance to the stairwell and the (six) elevators are on the right hand side. The stairwell can be entered from the central hall through two consecutive wooden doors with slim glass windows in them. No doors are in place to separate the elevator area from the central hall.

Intervention

The intervention consisted of multiple environmental changes. 20 green footprint stickers, leading from the main entrance to the stairwell, were placed on the floor of the central hall as shown on image 1. Different from the study of Van Nieuw-Amerongen et al. (2011) the footprints started right at the entrance with the idea that this would directly catch people's attention, making it more likely that they would follow the direction of the footprints.

Image 1. Intervention part 1: green footprint stickers leading from the main entrance to the stairwell.

Two identical A3 size posters were placed on eye height on the second door leading to the stairwell and on the wall of the first platform of the stairwell, which is halfway up to the first floor. They contained an approving injunctive normative message in the form of a positive emoticon in combination with the positive explanatory (Dutch) message ‘Goed Bezig! De trap nemen is goed voor het milieu en voor je eigen gezondheid!’ (image 2), which translates in ‘Good job! Taking the stairs is good for the environment and for your own health!’. The goal of this way of framing was to let participants feel good about their stair use and thereby reinforce future stair use. Lastly, two identical A4 size posters containing a disapproving injunctive normative message in the form of a negative emoticon in combination with an informative message about energy use of elevators and a reason for taking the stairs, namely, to help the environment (image 3), were placed above the elevator buttons, on eye height. No health related message was included on these two posters because this could lead to confusion when combined with the energy related statement. The logo of the Green Office Utrecht, the organisation that supported this project financially, was printed on the bottom of all four posters. Figure 2 shows the exact location of the different environmental changes in the intervention site.

Image 2. Intervention part 2: A3 size posters containing an approving injunctive normative message and a positive explanatory message.

Image 3. Intervention part 3: A4 size posters containing a disapproving injunctive normative message, an informative message, and a reason for taking the stairs.

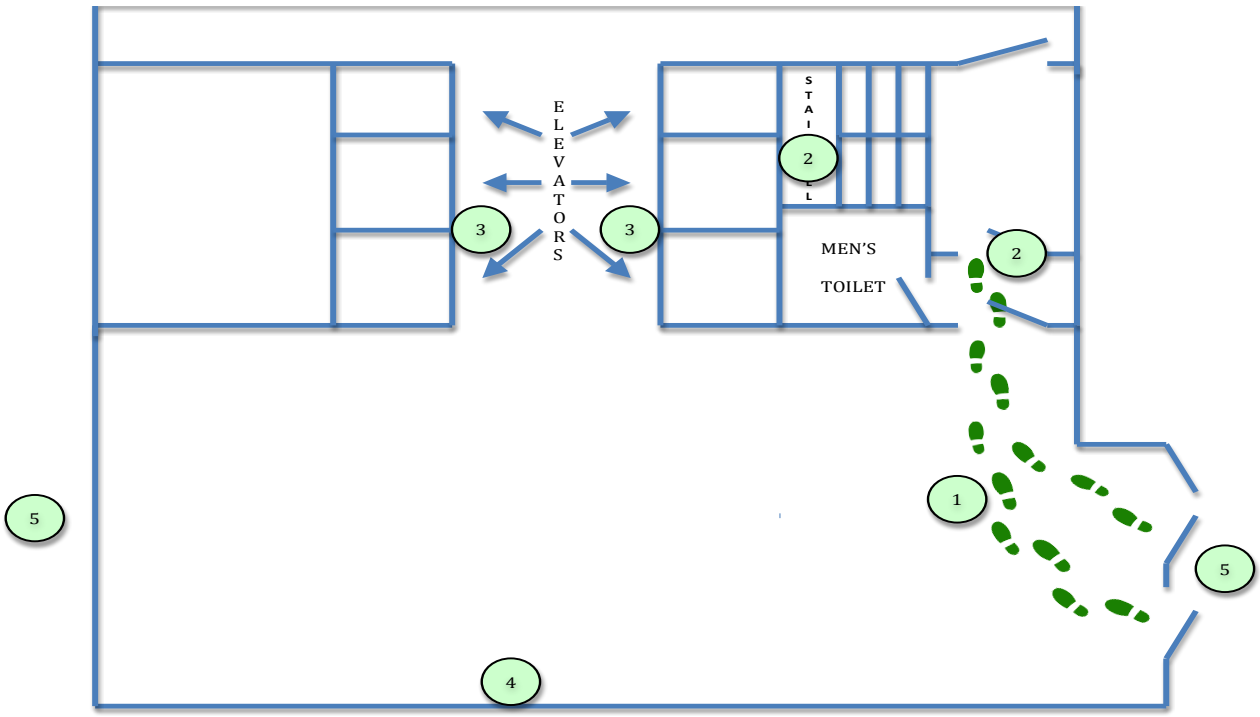

Figure 2. Schematic map of the intervention site after environmental changes were made. 1: green footprint stickers leading from the main entrance to the stairwell. 2: poster containing an approving injunctive normative message and a positive explanatory message. 3: poster containing a disapproving injunctive normative message, an informative message, and a reason for taking the stairs. 4: Camera for recording stair and elevator use. 5: Small signs warning people that they were being recorded for research purposes.

Design and procedure

This study used a mix of observation and conducting questionnaires to collect data. A one-group pretest-interventiontest design was used to test the intervention's effect on stair use. Over a 5-week period, participants were observed on Tuesdays and Thursdays on the busiest times of the day (between 8.30-11.15, 12.45-13.30 and 14.45-15.30). Tuesday and Thursday were chosen as observation days because, over the five weeks of research, the number of people present in the building and the distribution of people over the first four storeys were most stable on these days. The observations of the first week served as the base-line measurement (pre-test). On Monday in the second week of observation, the intervention was put in place, after which four weeks of intervention measurement followed. There was a two-week Christmas holiday break in between the second and third intervention measurement week.

For all the observations a camera was used, which was placed in the central hall of the building in such a way that it recorded both the entrance of the elevator area and the entrance of the stairwell. The exact camera position is indicated in figure 2. For privacy reasons the vision of the camera was made blurry by applying a thin foil in front of the lens, making facial recognition of participants impossible. A privacy protocol that is in line with Dutch privacy policy was drawn up (see appendix 1) and approved by Ron Mast, information manager of the University of Utrecht, and Jeroen Benjamins, supervisor of this Master Thesis. An important aspect of the protocol was that signs indicating that video recordings were made for research purposes were placed on the entrance doors (see figure 2).

The number of people ascending the stairs or elevator was counted by hand using the video recordings. People that carried a heavy load, were walking on crutches or had some other obvious reason they could not possibly take the stairs were not included in the counts. As can be seen in figure 1 and figure 2, when you enter the building through the main entrance, there is a corridor that is located behind the elevator area and stairwell area. In a pre-observation it was determined that close to zero people entered this corridor by walking through the stairwell area. If people entered the corridor by walking through the elevator area they were caught on camera and were not counted as taking the elevator. Also visible in figure 1 and figure 2 is the men's toilet, which is located just before the second door leading to the stairwell. To prevent miscounting by counting men as taking the stairs while they in fact went to the toilet, men that went through the first door leading to the stairwell and returned within 5 minutes were not counted as taking the stairs. In addition to basic counting, it was observed whether participants were walking on their own or with a group of people,

where ‘a group’ was defined as ‘two or more people closely walking and/or talking together’. Furthermore the number of people that decided to take the stairs after already being in the elevator area was counted to get insight in the *immediate* effect of the posters that were placed in this area. Finally, the number of times elevators had to go up to take participants to higher floors was counted to calculate the number of elevators per person. This way an estimate about possibly reduced energy use could be made.

On Wednesday in the first intervention week, two questionnaires were conducted. Both questionnaires had the goal to get insight in whether (1) people had actually seen the environmental changes (2) seeing the environmental changes made people consciously make a decision to take the stairs or the elevator (3) seeing the environmental changes made a difference for people’s future intentions with regard to stair use. One of the questionnaires contained questions that were specifically framed for people taking the elevator (appendix 2). To get some insight in the reasons people had for taking the elevator (despite the environmental changes) a question regarding this issue was included. The elevator-questionnaire was conducted in the elevator area on the second floor of the Willem C. van Unnik building. The other questionnaire contained questions that were specifically framed for people taking the stairs (appendix 3). This questionnaire was conducted inside the stairwell on the first floor, just after people had seen the poster(s).

Data analyses

A chi-square test was used to assess pre-intervention and intervention differences in stair and elevator use of the total group of participants. A three-way loglinear analysis – which is a chi-square test done as a regression (Field, 2009) – was done to assess the moderating effect of whether the entity taking the elevator or stairs was an individual person or a group of people. The statistical computer program IBM SPSS Statistics 22 was used for the analyses, applying a significance level of $p<.05$. The number of elevators per person for the pre-intervention and intervention periods was calculated and compared, as was the number of people that took the stairs after already being in the elevator area. Percentages were accumulated from the quantitative data resulting from the questionnaires. Qualitative data resulting from the questionnaires was interpreted after being grouped on similarity.

Results

Observational data

Table 2.

Percentages of people taking the stairs in the five separate observation periods. In the intervention periods, the amount of increase relative to the pre-intervention period is placed between brackets.

Period	% people stairs
Pre-intervention week	24.8
1st intervention week	31.9 (+7.1)
2nd intervention week	31.1 (+6.3)
3rd intervention week	33.5 (+8.7)
4th intervention week	31.5 (+6.7)

The pre-intervention measurement showed that 24.8% of the participants took the stairs and 75.2% took the elevator. A comparison between the pre-intervention period and the first intervention period revealed significant increases in the number of people taking the stairs (χ^2 (1) = 29.977, p < .001). Based on the percentages, this indicates that the proportion of the total group of participants taking the stairs was 7,1% higher in the intervention period than in the pre-intervention period. Significant increases in stair use were also found when comparing the pre-intervention period with the second (χ^2 (1) = 20.909, p < .001), third (χ^2 (1) = 37.134, p < .001), and fourth (χ^2 (1) = 25.191, p < .001) intervention period. These indicated, respectively, increases of 6.3%, 8.7% and 6.7%. The comparison between intervention periods one and two (χ^2 (1) = .253, p = .615), two and three (χ^2 (1) = 2.141, p = .143), and three and four (χ^2 (1) = 1.696, p = .193) showed no significant differences.

A three-way loglinear analysis produced a final model that included the variable of whether the entity taking the elevator or the stairs was an individual person or a group of people. The likelihood ratio of this model was χ^2 (0) = 0, p = 1. The highest-order interaction (intervention/no intervention x individual/group x stairs/elevator) was not significant when comparing the pre-intervention period with the first (χ^2 (1) = .243, p = .622), second (χ^2 (1) = 1.598, p = .206), third (χ^2 (1) = .773, p = .379) and fourth (χ^2 (1) = .938, p = .333)

intervention period. This implies that the type of entity (individual/group) had no significant moderating effect on the interaction effect between intervention and stair use.

The number of people that decided to take the stairs after already being in the elevator area amounted to 11 in the pre-intervention week, 11 in the first intervention period, 8 in both the second and third intervention period and 17 in the fourth intervention period. This indicates that there is no systematic change in behaviour after the posters were being placed in the elevator area and thus that these posters had no *immediate* effect on stair use.

The number of elevators per person was 0.344 in the pre-intervention period, 0.314 in the first intervention period, 0.367 in the second intervention period, 0.373 in the third intervention period, and 0.334 in the fourth intervention period. This shows that the reduced number of participants using the elevators does not unambiguously cause a reduced number of elevators used by the total group of participants.

Questionnaire stairs

The data from the questionnaires conducted in the stairwell (n=58, 32 men, 26 women) revealed that 39.7% of the participants had seen both the green footprints and the posters when asked whether they had seen anything special on their way to the stairwell. 8.6% had only seen the footprints, and 31.0% had only seen the posters. The remaining 20.7% indicated that they did not see anything special. When specifically asked whether they had seen the footprints, the percentage of people who indicated that they had rose from 48.3% to 67.2%. Likewise the percentage of people who indicated they had seen the posters rose from 70.7% to 81.0% when specifically asked for.

When asked whether they planned to take the stairs more often in the future, 19.0% indicated they did, 19.0% indicated they did not, 10.3% indicated they might, 51.7% indicated they already took the stairs quite often and they would continue doing so.

59.0% of the participants who indicated they had seen the green footprints said a thought arose when they saw them. Of these people, 8.7% had made the association between the green footprints and sustainability or health. 34.8% stated they explicitly thought the footprints led to the stairs/ were there to lure them into taking the stairs. 30.4% just thought ‘nice’, ‘good initiative’ or ‘good idea’. 17.4% had wandering thoughts about the footprints like whether it was for some kind of research, why the footprints were there, if they had always been there or who had put them there. Then there was one person who thought ‘good job, I have to go to the second floor so I’ll take the stairs’ and one person who thought the footprints would lead him to some party.

Questionnaire elevator

The data from the questionnaires conducted in the elevator area on the second floor (n=51, 19 men, 32 women) revealed that 27.4% of the participants had seen both the green footprints and the posters when asked whether they had seen anything special on their way to the stairwell. 11.8% had only seen the footprints, and 13.7% had only seen the posters. The remaining 47.1% indicated that they did not see anything special. When specifically asked whether they had seen the footprints, the percentage of people who indicated that they had rose from 39.2% to 58.8%. This number is not significantly different from the number of people that took the stairs and saw the green footprints (χ^2 (1) = .828, p = .363). The percentage of people who indicated they had seen the posters rose from 41.1% to 49.0% when specifically asked for.

When asked whether they planned to take the stairs more often in the future 19.6% indicated they did, 58.8% indicated they did not, 9.8% indicated they might, 7.8% indicated they normally took the stairs and would continue doing so.

50.0% of the participants who indicated they had seen the green footprints said a thought arose when they saw them. Of these people, 46.7% had made the association between the green footprints and sustainability or health. 26.7% thought it would indeed be better if they took the stairs or thought the green footprints would be stimulating. One person thought ‘coffee, can’t’. Then there were two people who were trying to figure out why the footprints were placed the way they were placed and one person who just thought ‘hm, green footprints’.

When asked for the reason why they had gone with the elevator (despite the nudges), 39.2% gave a reason that fits in the category laziness/convenience/comfort. 17.6% indicated that taking the elevator was automatic/habitual behaviour. 13.7% said they were simply following the group. 13.7% were sick, had bad knees or had some other good reason they could not take the stairs (this group of people was different from the participants that were excluded from the count of observational data, since the questionnaires were conducted on a day on which no observational data was collected). 11.8% thought the elevator would be quicker and/or said they were late for class. 3.9% indicated they took the elevator because it was easier to find (‘The building is a maze’).

Table 3.

Summary of the data resulting from the questionnaires on (conscious) perception of the nudges and future intentions, separated for people that took the stairs and people that took the elevator.

	% people stairwell	% of people elevator-area
Seen anything special on your way to the stairs/elevator?		
Footprints & posters	39.7	27.4
Only footprints	8.6	11.8
Only posters	31.0	13.7
Did you see the footprints?		
Yes	67.2	58.8
Did you see the posters?		
Yes	81.0	49.0
Do you plan to take the stairs more often in the future?		
Yes	19.0	19.6
No	19.0	58.8
Maybe	10.3	9.8
Already did	51.7	7.8

Discussion

The results showed that, as expected (H1), significantly more people used the stairs in a situation where a combination of (1) salience-enhancing green footprints and (2) posters conveying environmental related messages supported by injunctive social norms were present, compared to the base-line situation where no intervention was present. The expectation that this effect would be stable over time (H1a) was also confirmed, as there were significant differences between the pre-intervention week and all four intervention weeks separately, but no significant differences between the consecutive intervention periods. Contrary to what was expected (H1b), no moderating group/peer effect on the size and direction of the effect described above was found in this study. The absence of the group effect might be explained from the fact that, as mentioned in the introduction, peers can influence each other in two directions (Brass, Butterfield & Skaggs, 1998). It could well be

that the positive and negative influence of peers cancelled each other out in this particular situation.

The fact that the number of people that decided to take the elevator after already being in the elevator area did not clearly change, showed that it is unlikely that the posters in this area had an *immediate* effect on stair use. This does not mean, however, that these posters had no effect at all. It simply implies that *if* there is a positive effect of the posters on stair use, it takes the form of feedback that does not immediately persuade people to take the stairs but *does* stimulate future stair use.

The additional information that resulted from the questionnaires showed that – already on the second day of the first intervention week – the majority of people had seen the nudges, which implies that the effect that was found can reasonably be ascribed to the intervention. Although more people that took the stairs could spontaneously recall having seen (part of) the nudges, there was no significant difference between people that took the stairs and people that took the elevator when specifically asked whether they had seen the green footprints. This makes it unlikely that failing to perform the preferred behaviour can be ascribed to not having seen the green footprints.

Of the people that took the stairs after having seen the footprints a little less than half had thoughts that could be indicating that the choice for taking the stairs was a conscious one, of the people that took the elevator about two-thirds had similar thoughts. These were the people that (consciously) made the connection between the green footprints and sustainability/health, people that (consciously) made the connection between the green footprints and taking the stairs, and people who applauded the initiative. Although the method used to measure the level of conscious decision-making had quite a limited scope, since it consisted of only one question of which the answers given by participants did not unambiguously lead to one possible conclusion about the level of consciousness, it does give some reason to believe that the green footprints influenced people on a conscious level. However, future research with more elaborate measures is necessary to confirm this hypothesis.

Apart from the limited method used to measure the level of conscious decision-making, this study had a few other limitations. First, it was not observed to which floor participants that were counted were going. As a result it is not clear whether the effect that was found only applies to people that had to go to the first few floors or also to people that had to go to higher floors. Second, during observation, in a very small number of cases it was not completely clear whether a number of people constituted a group or were simply

individuals walking closely together. This might have had a tiny distorting effect on the outcomes in the comparison between groups and individuals. However, this effect would be so small that it is unlikely that the results would be significantly different if it had not occurred. Third, the privacy protocol required that signs that warned people about the camera were put on the entrance doors of the intervention site, and that there was always someone (me) on the intervention site to make sure the camera with its privacy-sensitive data was not stolen. Although the reason for filming was not made explicit, it is possible that the message and the presence of a camera and an observer of the camera caused some people to behave differently. However, given that these factors were both present in the pre-intervention and the intervention period, and given that from informal observation it seemed that people were not very much aware of the presence of the camera and observer, it is unlikely that this greatly influenced the outcomes. Fourth, due to the scope-constraints of a Master Thesis it was not possible to both test the endurance of the effect of a nudge over time *and* compare different kinds of nudges. Therefore, the choice was made to design one intervention, consisting of a combination of nudges that was very likely to work, and test its effect over time. The downside of this choice is that it is unclear whether the effect of the intervention was mainly caused by the green footprints, by the posters or by both equally. Neither is it clear whether green footprints alone, or posters alone, would have a similar effect. Last, as mentioned in the method section, there was a Christmas holiday break in between the second and third intervention week. The percentage of people taking the stairs was highest – be it not significantly higher than the other intervention weeks – in the third intervention week. It could be that New Year's resolutions had some role in this.

The 6-9% improvement that was found is this study shows that the intervention is among the most effective stair use interventions that have been tested (e.g. Van Nieuw-Amerongen et al., 2011), especially when considering the height (11 storeys) of the building. This makes the intervention useful in a health context, because the physical activity of a significant number of people was increased. However, the goal of this research was to save energy consumed by elevators and, based on the fairly stable number of elevators per person over the 5 weeks of research, it should be concluded that no energy was saved. The nudges in this study made the stairwell more salient and conveyed a clear moral message that indicated it was better to take the stairs. How come only 6-9% of the participants was positively influenced by this?

A plausible explanation can be found in Lindenberg and Steg's (2007) goal-framing theory. The central idea of their theory is that "goals govern or 'frame' what people attend to,

what knowledge and attitudes become cognitively most accessible, how people evaluate various aspects of the situation, and what alternatives are being considered" (Lindenberg & Steg, 2007, p. 119). They identified three main goals that are most relevant for environmental behaviour; the hedonic goal "to feel better right now", the gain goal "to guard and improve one's resources" and the normative goal "to act appropriately". At any time, there is one dominant goal and one or more background goals. The strength of the dominant goal can either be increased or decreased by the background goals, depending on whether they are in line or in conflict with each other.

In the stair use context, hedonic and normative goals seem to be in conflict. The elevator is simply more comfortable than the stairs (hedonic), but it would be better for the environment to take the stairs (normative). An additional factor that enhanced the hedonic value of taking the elevator in the intervention site of this particular research was the fact that, as mentioned in the method section, the elevators were physically more accessible than the stairwell, making the temptation to take the elevator (out of laziness) even bigger. Although the green footprints enhanced the salience of the stairwell, they did not improve its physical accessibility. The data from the questionnaires revealed that the main reason people gave for taking the elevator was indeed hedonic related (comfort/convenience/laziness). The results are in line with the idea that the hedonic goal frame, being concerned with enhancing satisfaction and happiness, is the most basic goal frame, which usually makes it stronger than the gain and normative frames (Lindenberg & Steg, 2007).

Since the moral appeal that was done on the participants was not strong enough to overrule the hedonic value of the elevator in large numbers of people, improving the hedonic value of taking the stairs seems to be a good addition to persuade people to take the stairs. This is not easy however, as the elevator will always be at least somewhat more comfortable than the stairwell. Furthermore the studies of Van Nieuw-Amerongen et al. (2011) and Boutelle et al. (2001) showed that improving aesthetic quality and adding music to the stairwell can have significant effects, but does not persuade large numbers of people to take the stairs. Another strategy that could be used is to reduce the convenience of the elevator, which has shown to have some small significant effects on the energy use of elevators (Van Houten, Nau & Merrigan, 1981). However, the desirability of this method is questionable, especially when the intervention is implemented in high buildings where taking the elevator is almost inevitable.

There are two lines of research that would be worth exploring in the future. First, it is interesting to see if green footprints alone have a positive effect that is similar to the effect

found in this study. Placing green footprints on the floor is a simple and cheap intervention that could improve people's health. If green footprints would be just as efficient without the addition of the (screaming) posters it would be a somewhat more elegant nudge and thus preferable in most situations.

Second, it might be interesting to combine an improved physical accessibility and aesthetic quality of the stairwell with green footprints and posters with injunctive norms. This might be a last possibility to raise the number of people that are convinced to take the stairs enough to actually save energy and attain pro-environmental ends. If this does not work it is unlikely that there exists a simple, unobtrusive intervention that would yield great energy-saving results. It should be considered, then, whether more drastic measures that go beyond nudging are appropriate to save energy consumed by elevators. It is imaginable, for example, to introduce an elevator system that does not stop at the first two floors of the building, which is already implemented in some buildings of the Vrije Universiteit in Amsterdam. This would, however, limit people's freedom of choice, which is not the case when using nudging. Therefore, nudging is still the preferable option and it is worth exploring it more.

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Appendix 1. Privacy protocol for camera use.

Privacy gerelateerd protocol voor cameragebruik in thesisonderzoek naar nudging in het Willem C. van Unnikgebouw op de Uithof in Utrecht.

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27-11-2015

Korte omschrijving van het onderzoek

In het kader van mijn masterthesis voor de opleiding Toegepaste Cognitieve Psychologie zal ik van 30-11-2015 t/m 15-01-2016 (exclusief kerstvakantie) in het van Unnikgebouw onderzoeken of het mogelijk is door het plaatsen van een aantal zogenoemde 'nudges' meer mensen de trap te laten nemen en zo energie te besparen. De nudges bestaan uit (1) groene stickers in de vorm van voetstappen die van de ingang van het van Unnikgebouw naar de trap leiden, (2) een poster met positieve feedback bij de trap, en (3) bordjes met negatieve feedback en informatie over energiegebruik van de lift bij de liften. Om te kijken of het plaatsen van deze nudges werkt, ga ik op verschillende momenten (2 dagen per week) gedurende 5 weken tellen hoeveel mensen de trap nemen en hoeveel de lift. De eerste week geldt hierbij als ‘benchmark meting’, er worden dan nog geen nudges geplaatst. Ook zal ik kijken naar het verschil in effect van de nudges op mensen die in een groep lopen en mensen die alleen lopen. Verder onderzoek ik met korte vragenlijsten of mensen de nudges bewust gezien hebben en daardoor over hun keuze zijn gaan nadenken e.d. Bij de dataverzameling van dit onderzoek wordt sterk rekening gehouden met de privacy wetgeving. Onderstaande geeft uitleg over de precieze procedure omtrent de dataverzameling.

Reden voor het gebruik van camerabeelden

De camera wordt binnen de bovengenoemde periode op dinsdagen en donderdagen ingezet om de volgende aspecten te kunnen meten:

1. Het aantal personen dat de trap neemt vs. het aantal personen dat de lift neemt.
2. Het aantal personen dat na het zien van de bordjes die zich bij de lift bevinden de trap neemt.
3. Het verschil in percentage personen dat de trap neemt tussen personen die in een groep lopen en personen die alleen lopen.
4. Het aantal liften dat per persoon wordt gebruikt.

Deze vier aspecten zijn de enige aspecten waarvoor de camerabeelden gebruikt worden.

De reden dat er een camera gebruikt wordt is dat eventuele andere meetmethoden niet voldoen om een betrouwbaar resultaat te behalen. Bewegings- en druksensoren zijn niet voldoende in staat onderscheidt tussen personen te maken, laat staan onderscheidt in de looprichting van deze personen. In dit onderzoek moet alleen het aantal personen dat naar boven gaat geteld worden, daarom voldoen deze sensoren niet.
Het inzetten van menselijke observatoren voldoet niet vanwege twee redenen. Ten eerste moet er teveel informatie tegelijk worden geobserveerd, een observator kan dit niet

nauwkeurig genoeg doen. Bij het gebruik van camerabeelden is dit geen probleem, omdat deze kunnen worden gepauzeerd. Ten tweede kan een observator in de setting van dit onderzoek niet onopvallend genoeg blijven, waardoor hij mogelijk het gedrag van mensen beïnvloedt.

Onherkenbaarheid van personen

De personen zullen zo onherkenbaar als mogelijk op de camera worden vastgelegd. Uiteraard moeten personen nog wel te onderscheiden zijn voor de genoemde onderzoeksdoeleinden. De gebruikte camera heeft niet de optie het beeld vager in te stellen, daarom zal het vervagen van het beeld zo veel als mogelijk gedaan worden door doorzichtige/matte folie voor de lens te plaatsen.

Bescherming gegevens

De camerabeelden worden in eerste instantie opgenomen op een sd-kaart. Aangezien deze niet versleuteld kan worden zal er altijd iemand in de centrale hal van het van Unnikgebouw aanwezig zijn om ervoor te zorgen dat de camera en de sd-kaart niet kunnen worden gestolen. Tevens wordt de camera op een hoogte opgehangen waar mensen alleen bij kunnen met een trappetje of een andere vergelijkbare verhoging.
Eenmaal opgenomen zullen de beelden gelijk, versleuteld met het programma ‘Truecrypt’, worden opgeslagen op mijn computer. De beelden op de sd-kaart worden dan gelijk gewist. De versleutelde beelden worden vervolgens zo snel mogelijk omgezet in ruwe onderzoeksdata. Zo gauw dit gedaan is worden de beelden ook van de computer gewist en bestaan ze niet meer.

Mededeling aanwezigheid camera

Op de deuren bij de ingang van het gebouw zullen bordjes komen te hangen waarop staat aangegeven dat er in de centrale hal van het van Unnikgebouw gefilmd wordt i.v.m. onderzoek. De tekst van dit bordje zal er ongeveer als volgt uitzien: ‘In de centrale hal van het van Unnikgebouw worden i.v.m. een onderzoek i.h.k.v. een masterthesis van 30-11-2015 t/m 15-01-2016 camerabeelden gemaakt. Bij de dataverzameling wordt sterk rekening gehouden met de privacy wetgeving. Meer info: Max Weghorst, e-mailadres’.

Appendix 2. Questionnaire elevator.

1. Neem je altijd de lift als je in dit gebouw naar boven moet?

Stellen als open vraag, zelf indelen in categorieën: ja/nee/af en toe/meestal/afhankelijk van verdieping

2. Is je iets opgevallen toen je naar de lift liep?

Nee, vraag 3.
Ja, wat? Afhankelijk van antwoord, vraag 3,4 of 5.

3. Heb je de groene voetstapjes gezien?

Ja/nee

4. Kwam er een gedachte bij je op toen je de voetstappen zag? Zo ja, welke?

Ja/nee, uitleg.

5. Heb je de bordjes bij de liftknoppen gezien?

Ja, vraag 5a, 6 en 7. Nee, vraag 6 en 7.

5a. Wat stond er op?

6. Waarom heb je er voor gekozen de lift te nemen?

7. Denk je erover na om vanaf nu misschien toch vaker de trap te nemen?

Ja/nee/anders, namelijk:

Appendix 3. Questionnaire stairs.

1. Neem je altijd de trap als je in dit gebouw naar boven moet?

Stellen als open vraag, zelf indelen in categorieën: ja/nee/af en toe/meestal/afhankelijk van verdieping

2. Is je iets opgevallen toen je naar de trap liep?

Nee, vraag 3.
Ja, wat? Afhankelijk van antwoord, vraag 3,4 of 5.

3. Heb je de groene voetstapjes gezien?

Ja/nee

4. Kwam er een gedachte bij je op toen je de voetstappen zag? Zo ja, welke?

Ja/nee, uitleg:

5. Heb je de posters gezien?

Ja/nee

6. ***Ben je van plan vanaf nu vaker de trap te nemen?***

Ja/nee/misschien/anders, namelijk:

Appendix 4. Interview about this research by Lisette Blankestijn for the intranet of Utrecht University.

maandag, februari 29, 2016 - 09:34

Voetstappenonderzoek: op weg naar de trap

Masterstudent Max Weghorst onderzocht met groene voetstappen in het Van Unnikgebouw hoe je mensen kunt stimuleren om vaker de trap te nemen, in plaats van de lift.

Wie eerder dit jaar in het Van Unnikgebouw kwam, kan het bijna niet ontgaan zijn: groene voetstappen op de vloer, die naar de trap leidden. Quasi-onopvallend zat Max Weghorst (masterstudent Toegepaste cognitieve psychologie) daar op een bankje: hij filmde en telde dagenlang hoeveel mensen de trap namen, en hoeveel de lift. Dagenlang.
"Ik wilde in mijn thesis onderzoeken hoe je met nudging goed gedrag kunt uit lokken", vertelt Max Weghorst. Nudging is een manier om bepaald gedrag te stimuleren. Niet met regels, maar met een subtiel duwtje in de goede richting, vaak op een onderbewust/impulsief niveau. Bekend voorbeeld: de vliegenstickers in mannenurinoirs. Max: "Er is al heel wat voetstappenonderzoek gedaan. In Denemarken bleek bijvoorbeeld dat groene voetstappen richting de prullenbakken tot 46% minder afval op straat leidde. Ik wilde kijken hoe je met nudging het energieverbruik kunt verminderen." Daarbij kwam hij al snel uit bij de lift in het Van Unnikgebouw.

Stickers föhnen
"Veel mensen realiseren zich niet dat liften goed zijn voor 5% tot 25% van het energieverbruik in gebouwen. Om het effect van groene voetstapstickers te kunnen meten , heb ik eerst een week geteld hoeveel mensen zonder voetstappen de lift en de trap namen. Voor de voetstappen zelf ben ik diverse stickerbedrijven afgegaan. Speciale vloerstickers bleven niet zitten op die ruwe vloer van het Van Unnikgebouw. Tijdelijke verf gebruiken mocht niet. Uiteindelijk ben ik een hele avond met een föhn in de weer geweest om sterkklevende stickers op de grond te plakken. Toen dat gelukt was, kon ik gaan meten. 4 weken lang turfde ik 2 dagen per week duizenden mensen."

Duurzaamheid
Max verwachtte dat de groene voetstappen een associatie zouden opwekken met natuur, duurzaamheid en gezondheid. Daardoor wezen de voetstappen niet alleen de weg naar de trap, maar vertelden ze ook iets over waarom het beter is om de trap te nemen. Ook hing Max bij de trap posters met een vrolijke smiley, waarop werd uitgelegd dat gebruik van de trap goed is voor je gezondheid en het milieu. Wie de lift nam ontmoette een negatieve smiley, met de mededeling dat de lift evenveel energie gebruikt als twee huishoudens. Het Green Office heeft de stickers en de posters gefinancierd - het afstudeeronderzoek paste in het Living Lab.

Uitkomst
Na 4 weken tellen was het spannend: was het gelukt om meer mensen de trap te laten nemen? "Ja!", vertelt Max. "Ik zag een significant verschil: waar zonder voetstappen bijna een kwart van de mensen de trap nam, was dat met groene voetstappen 7% meer." Toch is Max niet tevreden. "Wel waar het gezondheidsaspecten betreft: 7% van de bezoekers beweegt nu meer dan voorheen. Maar qua elektriciteitsverbruik zijn die voetstappen nutteloos. De energiebesparing is namelijk bijna 0. De oorzaak is simpel: de lift ging even vaak op en neer, alleen zaten er wat minder mensen in."

Is daar niet nog wat aan te doen? Max: “Hoe meer duwtjes in de goede richting, hoe beter. Dus niet alleen de voetstappen, maar ook een mooier trappenhuis, glazen deuren waardoor de trap beter zichtbaar is en tragere liftdeuren. Als die kleine maatregelen samen niet genoeg effect hebben, dan is een rigoureuzere aanpak misschien denkbaar. Bij sommige gebouwen van de VU in Amsterdam stopt de lift niet op de eerste twee verdiepingen. Dat zou een laatste redmiddel kunnen zijn.”.