

Persuasive technology against public nuisance – public urination in the urban nightlife district

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Abstract. Assumptions of the *goal framing theory* are applied to the specific context of a nightlife environment. Focusing on public urination as specific and often occurring antisocial behaviour in nightlife environments, this research explored how choice behaviour of potential public urinator can be influenced in a positive way. One boundary condition was to intervene in choice behaviour without negatively affecting the widely appreciated attractive and stimulating character of nightlife environments. Five experimental forms of nudging and priming are conducted to facilitate alternative social behaviour and to further stimulate potential public urinator to perform social behaviour. This was done by activating positive emotions, presenting visible and accessible alternatives and influencing subjective norms. Facilitating social behaviour reduced public urination by 41%, while additional interventions reduced public urination up to 67%. The results contribute to an extension of *goal framing theory* to specific contexts like nightlife environments.

Keywords: field experiment; goal framing theory; nudging; priming; public urination

1 Introduction

Nightlife environments are widely appreciated because of their stimulating and adventurous character. This type of environment offers intense experiences from a wide range of positive and negative emotions ranging from fun and excitement to fear and stress [1; 2]. Although these environments are appreciated, all types of antisocial behaviour occur. Public urination is one of the most common problems in nightlife environments [3; 4]. To discourage this type of behaviour, the main challenge is to take measures by keeping in mind what makes these environments so attractive [5; 4].

In earlier research, it was already pointed out that, in general, strategies to prevent the occurrence of antisocial behaviour are more (cost-)effective than repressive strategies [6]. The most economical procedure is to stimulate the right behaviour by providing response priming instructions (i.e. signs with anti-litter messages) at appropriate times, since the effectiveness of general incentives often drops when the incentive stops [7].

Providing response priming instructions to prevent the occurrence of public urination without negatively affecting the attractiveness of the environment can, in our view, be considered persuasive technology [8], i.e. subtle persuasion by the use of technology and environmental interventions.

1.1 Theoretical approach

One way to explain how persuasive technology works is by looking at the psychological concepts of the *goal framing theory* [9]. The theory states that behavioural goals steer intentions, determine which knowledge and attitudes are activated, how different aspects of a situation are evaluated and which alternatives are considered [10]. Goal framing theory distinguishes three overarching goals which include the most important aspects of human functioning: 1) hedonic goals, focussing on direct need fulfilment, 2) gain goals, focussing on getting and maintaining resources for need fulfilment and 3) normative goals, focussing on conforming to social norms and rules to fit into social contexts. All three overarching goals interact with each other and are all activated to some degree. Due to internal and external cues, a certain goal can become more dominant than others. At that point, behavioural and attentional processes are most strongly framed by this goal (1). The right external cues can be provided at the right moment by using persuasive measures.

Influencing choice behaviour. Related to the topic of public urination in nightlife environments, persuasive technology could focus on influencing the choice between prosocial or antisocial behaviour when a person needs to go to the toilet. The prosocial choice is using a toilet and in this case the antisocial behaviour is public urination, for instance in a dark alley.

In order to influence social behaviour via activating specific goals, a basic understanding of the three overarching goals is needed. Direct need fulfilment (hedonic goals) for instance, is explained by theories and models on affect and emotion. When these goals are most strongly activated, emotional bonding from a person with his surrounding environment could for instance be a motivator to behave more prosocially [11].

Getting and maintaining resources for need fulfilment (gain goals) is explained by theories of rational choice. According to these theories, social behaviour depends on the intention of a person and the context of the situation [12]. The intention of a person is formed by attitudes and subjective norms and the perceived behavioural control. Attitudes and subjective norms are formed by expected costs and benefits and the extent to which the person believes that a certain behaviour is right or wrong according other people. Perceived behavioural control is formed by the extent to which a person believes he or she is able to perform a certain behaviour [12].

The role of conforming to social norms and rules to fit into social contexts (normative goals) is an important concept of the theory of normative conduct, which states that norms systematically influence behaviour once they are activated [13; 14].

The norm activation model (NAM) [15] describes that norms become activated once a person 1) is conscious of the problem and consequences of the certain behaviour, 2) feels responsible for the consequences, 3) is able to identify and 4) perform a prosocial alternative.

The factors described above are requirements in order to stimulate a pro-social choice when a certain goal is activated. These factors already show that there is a certain overlap in the overarching goals. Perceived behavioural control in order to stimulate a pro-social choice when gain goals are activated is for instance closely related to being able to identify and perform a prosocial alternative. These two factors are closely related to the factors needed to activate normative goals. Lindenberg & Steg [9] continue on this overlap by describing how behavioural goals could either strengthen or inhibit each other. In case of public urination, when a person needs to go to the toilet the intention to use a toilet (pro-social choice) will be strengthened once personal norms are activated. The predictable power of the theory of planned behaviour will grow in that case [16; 17]. However, the opposite is true as well. When a person has the intention to use a toilet but he is not able to easily find one, the personal norm to use a toilet becomes weakened and the chance of public urination grows [9].

The context of a nightlife environment. Knowing which factors could influence the choice between a pro-social or anti-social alternative is important in order to influence this choice behaviour. As described before, the behavioural goal that becomes most strongly activated determines what a person thinks at that moment, which information is processed and which alternatives are considered [10]. However, in this process the context of a nightlife environment plays an important role. First because of personal norms and views of visitors of a nightlife environment. Visitors often see the nightlife environment as a place where there are different social norms compared to home, school and work [5] and as a place of self-indulgence, with no restrictions [18]. Secondly, attentional processes for instance become restricted with the use of alcohol. Giancola et al. [19] describe this as the *Alcohol Myopia Effect*, which in general leads to a restriction of cognitive processes. One of the problems then is that people are for instance less able to find a suitable pro-social alternative like a toilet or they are less aware of the social norm.

Although cognitive resources are limited in a nightlife environment there are some good opportunities to stimulate pro-social behaviour. One effective way is by providing subtle signals in the direct environment. This is called nudging, small changes in the information that a person is confronted with when making a decision [20]. Nudges respond to automatic processes and are very useful when attention and cognitive processes are limited [21]. An example of a nudge is the use of marked lines on a floor in order to 'guide' people to the stairs instead of a nearby elevator. This could lead to a considerable higher number of people using the stairs [22].

Another opportunity that is closely linked to nudging is *priming*. The concept of priming uses so-called *primes*: subtle incentives that unconsciously activate certain knowledge about a social situation. Often, this knowledge is about situational norms which represent general accepted beliefs about how to act in a certain situation [23].

A library for instance is a specific environment where it is generally accepted and well known that people should be quiet [24]. Showing a picture of this familiar environment to people could result in these people actually showing this behaviour [23]. Two boundary conditions for the effectiveness of a prime are the extent to which the used prime suits the local context where it is used [25] and the availability of a useful alternative to perform the right behaviour [26].

The study. In this study several persuasive (technological) interventions are applied in order to stimulate visitors of a nightlife environment to use a toilet instead of choosing for public urination.

Toilet availability. Having the opportunity to perform the right behaviour is a necessary requirement for the interventions to work [11]. In this case, an opportunity to perform the right behaviour is the availability of a toilet facility (i.e. a public urinal).

Light projections. As mentioned before, a person's emotional bonding with his/her surrounding environment could be a motivator to behave more prosocial when hedonic goals are active [11]. Well-designed lighting can be a source to stimulate this factor. Where bright light was found to have a positive influence on self-consciousness [27], coloured light was more effective in stimulating pro-social behaviour via affective reactions [28; 29].

Arrows. Earlier studies [22] found that marked lines on the ground steering people to the stairs can lead to a considerable higher number of people using the stairs. The same effect was found when they marked footsteps on the ground leading to a litter bin. The amount of littering in the street was reduced because more people threw their litter in the bin. Following these results, arrows on the street leading to the toilet are used to facilitate perceived control of having a suitable alternative in a context where attention and cognitive processes are often limited.

Graphics. Norms can either be implicitly (e.g. design) or explicitly (e.g. verbal messages) activated [23]. Implicit activation works via unconscious mental representations. For instance by activating the social norm of being silent through the presentation of a graphic of a library environment [23]. In this study, graphics of intimate music concerts are presented in order to represent a situational social norm which suits the local context of a nightlife environment - an important boundary condition as described before.

Arrows and light projections combined. As described before, goal framing theory [9] states that the different overarching goals are always activated to a certain degree and influence each other. In order to explore if different factors activating these goals can strengthen each other, arrows and light projections are combined in this study as well.

Hypotheses. For each intervention it is assumed that it will lead to a decline in the number of public uriners compared to a normal situation where factors leading to a pro-social choice are not actively stimulated.

2 Method

The experiment took place in one of the nightlife areas in Amsterdam, the Rembrandt Square (Rembrandtplein), in eight consecutive weeks in April and May 2016. Two relatively similar sub areas were selected, an experimental and a control location (EL versus CL); in both locations there is a relatively dark alley with recesses facilitating public urination (see Fig. 2). At the EL this alley is app. 55 meters long and 3 meters wide; the CL measures 70 x 6 meters. To reduce public urination, our manipulations were situated in or near the alley at the EL. Average numbers of public uriners on social evenings are 68.57 for the EL and 44.79 for the CL.



Fig. 1. Experimental (left) and control (right) locations

2.1 Participants and Design

Our sample consisted of part of the 10 000 – 15 000 people that on average visit the Rembrandt Square nightlife area during social evenings. The field experiment had a one-factor design, with five manipulations: Toilet Availability, Arrows, Light Projections, Graphics and Arrows and Light Projections Combined. Before the interventions took place, pre-test measurements of public urination were conducted for two weeks at the EL and CL. The interventions were alternated weekly at the EL, each separately for one week, in the subsequent weeks, with the exception of Toilet Availability: this was tested as a stand-alone manipulation, but remained in place during later manipulations. Each week, the same measurements were conducted at the CL.

For each separate condition, measurements at the EL and CL were contrasted with the pre-tests (a standardized difference score of the number of public uriners per hr.

between pre-test and intervention week) at both locations before they were contrasted against each other.

Toilet Availability involved placement of a Kros Mobile Urinal Unit to facilitate socially desirable behaviour. Placement was such that visibility and usability were ensured. At about 10 meters distance from the alley in the EL, this urinal unit could be used by four persons at the same time. After placement, the urinal unit remained in place during the entire test period [cf. (2)] (See Fig. 3).



Fig. 2. Placement of the mobile urinal unit; the entrance to the EL can be seen in the background

Arrows were used to increase visibility of the urinal arrows. These were taped to the ground with broad yellow tape, accompanied by “WC” (i.e., toilet; white letters printed on a purple sticker), pointing out the urinal to people coming from multiple directions. This manipulation aimed to bring a usable alternative to public urination to the attention of those who were about to relieve themselves and who had an alcohol-induced limited attention capacity. See Fig. 4 (left panel).

Light Projections were used to invoke a positive affective response (3). Projectors mounted high up on walls in the alley at the EL projected colourful non-figurative artistic images with round or oval-shaped boundaries onto the floor. See Fig. 4 (right panel).

In the Graphics condition images of intimate musical performances were placed on the walls. Specifically, these images featured singers in the singer-songwriter genre, engaged in passionate performances and in some cases surrounded by a captivated audience. These aimed to activate subjective norms associated with these settings, so as to make people abstain from public urination (which in the portrayed settings can be considered socially undesirable); this is similar to priming manipulations used for instance by (4). Selecting a setting (musical performances) that shares overlap with the festive nightlife atmosphere increases the likelihood of norm activation (5).

In the final condition the Arrows and Light Projections were simultaneously present (Arrows and Light Projections Combined).



Fig. 3. Arrows (left-above), Light Projections (right-above) and Graphics (right and left under) manipulations (EL)

2.2 Procedure

Visitors could enter the alley at the EL from four different directions. Because people coming from three of these directions had a better view of the urinal and were closer to it than those coming from the other direction, the former were lumped together in one group.

Using three cameras, measurements were taken on Fridays and Saturdays between 23:00 and 06:00 hours. One camera was aimed at the control location (CL), one on the experimental location (EL), and one on the urinal. After each weekend, the number of public urinals per hour was counted at both the CL and the EL; this variable was our dependent variable. For each public urinator registrations the time was noted, as well as the direction this individual came from. The number of people who used the urinal was also counted. Background variables that were incorporated included the number of passers-by (crowdedness), weather conditions, the number of parked bicycles in the alley, and the number of social interactions (i.e., when people slowed down or stopped to talk to someone else). These latter variables are, however, beyond the

scope of this paper, and will not be discussed further. It should only be noted here that these background variables, in general, had little to no influence on the number of public urinators.

Camera footage was made available by the local police department; these could only be scored at the police office precinct, and were erased afterwards.

3 Results

The number of public urinators at the EL during the pre-tests was the highest number counted in this study ($M = 45.00$, $SD = 1.02$). The largest part of this group came from the direction where people had no direct sight at the later placed toilet facility. During the whole study, most public urinators were counted between 00:00 and 04:00 AM.

Toilet availability led to a decrease in the total number of public urinators per night of almost 40% ($M = 28.00$, $SD = 6.11$). The decline of public urinators per hour at the EL ($M = -0.79$, $SD = 0.78$) differs significantly from the variation at the CL ($M = 0.10$, $SD = 0.48$), $t(54) = -3.994$, $p < .001$. Further analyses of both groups entering the EL from different directions show that toilet availability leads to a significant difference in the variation in public urinators with direct view at the toilet ($M = -1.08$, $SD = 0.87$), $t(54) = -5.192$, $p < .001$. There was no effect in the group of people with no direct sight. Facilitating people reduced the total number of public urinators by seventeen people, mainly coming from directions where there was direct sight at the toilet.

Arrows on the street, pointing to the toilet from every direction, led to a decrease of about 51% in the total number of public urinators per night ($M = 23.00$, $SD = 6.11$). The variation in the number of public urinators per hour at the EL ($M = 1.01$, $SD = 1.28$) differs significantly from the variation at the CL ($M = 0.08$, $SD = 0.55$), $t(26) = -2.936$, $p = .004$. Comparing the two groups with and without direct sight at the toilet, it turned out that the variation in the number of public urinators per hour only differed significantly in the group with direct view ($M = -1.02$, $SD = 1.41$), $t(26) = -2.738$, $p = .006$. Although the variation in the number of public urinators without direct sight showed a decrease at the CL as well ($M = -.39$, $SD = 1.03$), no significant effect was found using a 95% confidence interval. Arrows on the street reduced the total number of public urinators by twenty-two people, mainly coming from directions where there was direct sight at the toilet.

Light projections led to a decrease of about 51% in the total number of public urinators per night ($M = 23.00$, $SD = 5.19$). The variation in the number of public urinators per hour at the EL ($M = -1.01$, $SD = 1.39$) differs significantly from the CL ($M = -0.36$, $SD = 0.36$), $t(26) = -1.694$, $p = .051$. Further analyses of the both groups showed that the light projections only led to a significant variation in the group with direct sight ($M = -1.33$, $SD = 1.32$), $t(26) = -2.648$, $p = .007$. No effects were found for the group without direct sight. Coloured light projections reduced the total number of public urinators by twenty-two people, mainly coming from directions where there was direct sight at the toilet.

Hanging graphics at both sides of the EL had no effect on the number of public urinals ($M = 42.50$, $SD = 11.93$) compared to the pretest. There was a significant variation in the number of public urinals with direct view on the toilet ($M = -0.87$, $SD = 0.80$), $t(26) = -3.157$, $p = .002$. However, these people were not able to see the graphics before they chose to use the toilet. Therefore, this effect is ascribed to the toilet instead of the graphics.

The combination of arrows and light projections led to a decrease of about 67% in the total number of public urinals ($M = 15.00$, $SD = 4.20$). The variation in the number of public urinals at the EL ($M = -1.39$, $SD = 0.75$) differs significantly from the CL ($M = -0.24$, $SD = 0.40$), $t(26) = -5.026$, $p < .001$. Further analyses of both groups showed again that the intervention only led to a significant variation in the group with direct sight ($M = -1.36$, $SD = 1.14$), differing significantly from the CL, $t = -3.465$, $p = .001$. Although the variation of public urinals without direct sight at the toilet became stronger, following the trend of the variation after using arrows only, no significant effect was found. The combination of arrows and light projections reduced the total number of public urinals by thirty people, mainly coming from directions where there was direct sight at the toilet.

4 Discussion

This study explored how potential public urinals can be stimulated to make a pro-social choice: using a toilet. The study was built on leads mainly from the goal framing theory [9]. Following this theory, it was assumed that the process from a need for a toilet to the choice between using a toilet (pro-social) or public urination (anti-social) is framed by three overarching goals: hedonic, gain and/or normative goals. These goals steer intentions, determine which knowledge and attitudes are activated, how different aspects of a situation are evaluated and which alternatives are considered [10].

First, the study found statistical evidence for the need to have a suitable alternative in order to stimulate pro-social behaviour [1]. All the interventions only had an effect when people were able to directly see the toilet. Toilet availability on its own led to a significant decline in the total number of public urinals with direct sight at the toilet. This could be explained by potential public urinals with an activated gain goal having the possibility to easily find resources for direct need fulfilment [2]. Potential public urinals with active normative goals might have been facilitated in having a suitable alternative to perform social behaviour [3].

The effect of toilet availability can easily be strengthened by adding arrows on the ground pointing towards the toilet facility. It is expected that arrows mainly strengthen the visibility of a useful alternative, an important factor when gain goals are activated [2]. However, this effect is limited to the distance that people have to walk and possibility of having direct sight of the target (toilet facility). The effect of arrows was only found in the group of people having direct sight at the toilet. The effect of adding arrows supports findings from [22] where people easily follow lines on the ground to the stairs. The effect also provides statistical evidence for the assumed thought that

potential public urinals are easily led by subtle signals in the direct environment when costs and benefits are limited [4; 5].

The same effect is applicable to coloured light projections focussing on emotional bonding with the direct environment. These light projections were able to further reduce the number of public urinals. Especially when the light projections were combined with arrows. It was striking to see that many people were interacting (e.g. dancing and taking pictures) with the light projections. It is therefore assumed that light projections had a positive effect on emotions [6], but a visible and useful alternative is necessary in order to really influence the choice behaviour of potential public urinals.

No statistical evidence was found for the assumed effect of graphics. On the one hand, this could mean that subjective norms do not influence the choice between a pro- or anti-social choice. For instance, because potential public urinals unconsciously use heuristics about public urinating in nightlife environments instead of moving through a full process of choice where personal norms are being evaluated [4; 5]. On the other hand, it is possible that the intervention did not succeed in activating subjective norms. Lindenberg & Steg [(9) described earlier that subjective norms need the most support in order to be activated while Giancola et al. [19] add that attentional processes might be limited because of the use of alcohol. It is assumed that the latter is true in this case, while it was striking to see during the data collection that people passing by hardly seem to actively look at the graphics on the wall.

Interpreting the results of this study, it should be noted that there are some limitations to the reliability of the CL. Even though the EL and CL had some corresponding physical characteristics there are some important differences as well. First, the CL is in a less crowded part of the nightlife district compared to the EL. Second, the CL has some visible entrances to houses and a hotel, where the EL has fewer and less visible entrances to houses.

Because of the fact that the results of this study are highly contextual, the original plan was to simultaneously perform the experiments at an EL and CL in another large city in the Netherlands. Even though preparations were in an advanced stage, it proved impossible to do that.

Further research could benefit from measuring the degree to which factors activating behavioural goals (e.g. emotion, perceived behavioural control, subjective norms) are already activated. With this information it would be possible as well to explore to what degree these factors should be activated by comparable interventions in order to find people willing to walk further to a toilet when they do not have a direct sight on the toilet.

The same accounts for the use of alcohol. This study did not take into account the number of alcohol that participants used. Measuring levels of alcohol use could provide interesting information about the interaction between alcohol and behavioural goals related to antisocial behaviour in nightlife environments.

4.1 Conclusion.

This study shows that there are effective ways to intervene in antisocial behaviour in nightlife environments, without causing any damage to the widely appreciated attraction of this environment. The results offer an extension of the goal framing theory [9] to the specific context of a nightlife environment. In this environment, influencing choice behaviour is most effective by facilitating and stimulating the visibility and usability of a suitable alternative for pro-social behaviour. This could easily be achieved by providing a toilet facility and optionally stimulating extra usage of this toilet by referring to it with arrows on the street. Once these boundary conditions are fulfilled, positively influencing emotional factors could lead to even better results. In that case, the stimulating and adventurous character of the nightlife environment can maintain itself by restraining its own negative effects in a positive way.

5 References

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