Eyes in the Skies

Exploring the effects of social presence cues
on undesired and pro-social behaviour

Anja M. Jansen

UNIVERSITY OF TWENTE.

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and pro-social behaviour

DISSERTATION

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Chapter 1

General Introduction

Imagine yourself on the campus of the University of Twente on your way to today's lecture. You decide to grab a quick coffee, but this takes more time than you anticipated. Now you are hurrying over the campus, trying to get to your lecture on time. At that moment, your phone rings. You fiddle around with your coat and your bag, still with a -now empty- cup of coffee in your hand. You need to dispose of it, but there is not a trash can in sight, and you don't want to put the leaky cup into your bag. When arriving at the door, you have to make a decision, so you can finally grab your phone and quickly answer the call before the lecture starts...

What would you choose to do in this situation? Would you consider dropping the cup on the ground? Would you be more tempted to do so if there were a lot of littered cups around? Would you behave differently if you saw somebody watching you or if you noticed a surveillance camera? And what if a pair of eyes depicted on a poster would be staring at you; would that make a difference?

This dissertation focuses on the effect of environmental factors like disorder, the presence of cameras, mirrors, or images of eyes on undesirable behaviour such as littering and cheating. In an attempt to unravel the underlying psychological mechanism(s), I combine theories and research from criminology, social psychology and environmental psychology, and also take personality factors into account. As such, I aim to contribute to a better understanding of the factors provoking undesired behaviour, which could help devise effective strategies and policies to reduce the monetary and social costs of these kinds of transgressions.

Undesired behaviour – A rational choice?

I use the term 'undesired behaviour' for relatively small transgressions such as littering or telling lies. Transgressions like these might not be punishable by law, but can result in a lot of damage for the society at large. In this dissertation I will focus on littering and cheating as instances of undesirable behaviour, as these kinds of behaviour have been studied before in experimental settings, are not too severe, and can be observed reliably (e.g., Gerlach, Teodorescu & Hertwig, 2019).

Littering can be considered a serious problem: it is unsightly, negatively influences neighbourhood perception (e.g., impressions of attractiveness and safety), and it is harmful to the environment (Schultz, Bator, Large, Bruni & Tabanico, 2011). The annual costs of preventing, cleaning and processing litter in the Netherlands alone have been estimated to be approximately 250 million euro (Deloitte, 2010). Additionally, visible traces of disorderly behaviour, like littering or vandalism, might eventually lead to an increase of a range of undesirable behaviours, ranging from more littering (Cialdini, Reno & Kallgren, 1990) to vandalism and theft (Keizer, Lindenberg & Steg, 2008).

Many areas of research reason that undesired behaviour might stem from a simple comparison of costs and benefits; theories along this line have been formulated in disciplines such as sociology, psychology, and economy. This line of reasoning stems from

the roots of criminology. Classical thinkers and philosophers from the mid-18th century, like Cesare Beccaria and Jeremy Bentham, argued that the source of crime is a simple costs/benefits calculation (e.g., Beccaria, 1764). In the mid 60's, Gary Becker formulated 'A Simple Model of Rational Crime' (SMORC; Becker, 1968), stating that anyone would commit a crime when the benefits outweigh the risks, without taking other factors, such as morality or conscience into account.

Many contemporary crime prevention policies are based on these long-standing theories (Clarke, 1997; Homel, 1996). They focus, for instance, on increasing the cost of crime by adding fines, or increasing the risk of detection by increasing police surveillance or closed-circuit television (CCTV). Cornish & Clarke (1986) formulated the 'Rational Choice Theory' (also referred to as the Rational Choice Model of Crime), aimed at situational crime prevention, stating that social control is an important factor in deterring criminal behaviour because of the increased chance of getting caught. This 'Rational Choice' theory of crime postulates that – in addition to an accessible target and a motivated offender – a third element should be present in order for people to commit a crime: a lack of social control. Following this line of reasoning, and in order to prevent crime, it appears important to emphasize the element of social control either as an actual person, or the implied presence of someone watching through CCTV.

The role of camera surveillance

While an increase in camera surveillance and thus the risk of getting caught should reduce crime, research on the effects of CCTV presence shows that these mechanisms might be more complicated. The findings of meta-analyses by Welsh and Farrington (2002, 2009) indicate that merely the presence or absence of cameras does not suffice: camera surveillance proved effective in many, but certainly not all circumstances. In his study on the effects of security cameras on public behaviour, Levine (2000) argues that in order for camera surveillance to be effective, people should: 1) be aware they are being monitored, 2) know who is watching, and 3) know which behaviours are punishable. This is corroborated by the Routine Activity Theory (Felson, 1998), which states that one of the three factors that could prevent the occurrence of a criminal incident is the presence of a capable guardian. A security camera could induce the feeling of the presence of such a guardian, leading to increased risk of detection and punishment. According to a complementary approach, the Social Control Theory (Hirschi, 2002), this capable guardian should be perceived as an authority figure who has the ability to punish, thus placing strong emphasis on the probability of detection and the risk of punishment. Following this line of reasoning, the salience of camera surveillance is important, and preferably framed in such a way that people have the impression that an authority figure is watching.

Does one type of undesired behaviour lead to another?

In 1982 Wilson and Kelling suggested in their Broken Windows Theory (BWT) that cleaning up a city would lead to reduced crime rates. This theory is based on the

assumption that signs of petty crime and disorder in a neighbourhood will eventually lead to more serious crime and disorder in that environment. The original line of reasoning of the BWT assumes a rational process of interpreting signs of disorder in the environment. Wilson and Kelling propose that a disorderly environment signals that the area is not actively monitored, and people can break social norms with a minimal risk of getting caught (Wilson & Kelling, 1982).

After this theory was adopted as a policy in New York City as of 1984, statistics showed that within a few years of cleaning and stopping minor offenses like graffiti (zero tolerance policy), crime rates of both petty and serious crime dropped significantly (Kelling & Coles, 1996; Corman, 2005). Thereafter, the BWT was implemented in the policing strategy in several cities all over the world. However, the BWT did not go without criticism; there was often an alternative explanation for the drop in crime rates after cleaning the cities, like a change in demographics or a decline in the use of cocaine (e.g., Harcourt, 1998; Harcourt & Ludwig, 2006). In order to test whether the effect theorized by the BWT was actually valid in different real-world settings, Keizer, Lindenberg and Steg (2008) put the BWT to the test by conducting several field experiments. The results of these experiments did indeed support the BWT: signs of disorder in the environment increase occurrences of undesirable behaviours such as littering, trespassing, and even stealing.

The BWT was revolutionary for its time, since it was one of the first frameworks which considered the inferences that people make based on their physical environment. The BWT puts emphasis on the effects of social context and the psychological processes which might be evoked by elements within the physical environment. In their original article, Wilson and Kelling (1982) state: '[...] one unrepaired broken window is a signal that no one cares, and so breaking more windows costs nothing. (It has always been fun.)', which suggests a rational process is the underlying mechanism driving this effect. Later research shows that the effects of the environment might be more subconscious. For example, research by Cialdini et al. (1990) showed that if litter was visibly present in an area people tended to litter more, which led them to conclude that there must be an underlying mechanism causing people to make inferences about social rules and subsequently act accordingly. Cialdini et al. (1990) coined this phenomenon 'social proof'. Generally, research shows that social proof exerts a powerful influence on behaviour and that such influence generally occurs outside of people's awareness, (see e.g., Nolan, Schultz, Cialdini, Goldstein & Griskevicius, 2008). Many decisions are influenced by subconscious thoughts and impressions: intuitive instead of conscious thinking (Kahneman, 2012). A steadily growing body of research testifies to the far-ranging effects that implicit social factors can have on people's behaviour.

In this dissertation I considered both rational and more subconscious mechanisms to examine the effects of environmental factors on undesirable behaviour.

The role of personality

Research on littering suggests that littering is influenced by many different factors, including individual characteristics (e.g., age, gender, residence, and occupation) as well as the social and physical environment (Robinson, 1975). Research on risky behaviour (e.g., behaviours such as excessive drinking and unprotected sex), for instance, shows that the personality traits extraversion and neuroticism combined with impulsiveness can predict a variety of risky behaviours (Cooper, Agocha, & Sheldon, 2000). It is likely that personality factors play a role in whether or not people are swayed to exhibit different types of undesired behaviour.

Next to direct effects, personality factors might also influence (i.e., moderate) the relationship between elements from the physical environment and people's inferences and behaviour. Research indicates that there are large differences in the extent to which people are susceptible to influences originating from the social and physical environment (Rotter, 1966; Straham & Gerbasi, 1972; Gangestad, 1986). This suggests that personality factors might moderate the influence of environmental factors such as the visual presence of disorder and security cameras on behaviour.

There are a number of personality factors which likely play a role in people's sensitivity to the environment and how individuals would be influenced by the impression of being watched. First, *Locus of Control* (LOC) represents the extent to which people believe their behaviours are dictated by external factors. Generally, people with an internal LOC feel in control of their own lives, while an external LOC entails that people feel their lives are guided by external factors, such as fate or the actions of others (Rotter, 1966). As the environment can also be considered an external factor, individuals with an external LOC may be more attuned to signs of implicit behavioural standards originating from the environment than individuals with an internal LOC. Therefore, a disorderly environment could have more impact on people with an external Locus of Control. *Need for Approval* and *Self-Monitoring* are personality measures which could be considered to investigate how the presence of cameras could affect people's behaviour. People with a high Need for Approval are more concerned about impression management, and might be more inclined to show 'good' behaviour and avoid 'bad' behaviour in front of others (cf. Van Rompay, Vonk & Fransen, 2009). Self-monitoring is very close to this concept; it describes to which extent people are willing to adapt their behaviour in order to get the approval of others (Gangestad, 1986). Lastly, since the presence of a camera might activate personal norms and values, *Social Value Orientation* could be assessed to indicate whether a person is more inclined to behave pro-socially or more egoistically.

The impression of being watched

A common denominator of several of the aforementioned personality factors is that they take 'monitoring' into account: how do we see ourselves and how do others see us? Generally, the feeling of being watched seems to be an important factor for influencing

behaviour. According to the Rational Choice theory (Cornish & Clarke, 1986) and the Social Control theory (Hirschi, 2002), the presence of surveillance might deter people from undesirable and criminal behaviour. According to research by Straham and Gerbasi (1972), and Gangestad (1986), the presence of others might cause people to change their behaviour in such a way to gain the approval of others (i.e., the general public).

Yet, according to two meta-analyses conducted by Welsh and Farrington (2002, 2009), studies reveal inconsistent results, with some studies showing CCTV to be effective in preventing undesired behaviour, while others show no effect of the presence of cameras. Arguably, these inconsistent results have been caused by the different ways in which the cameras are positioned and framed. For example, are the cameras indoors or outdoors? In a wide-open space, or in a closed, controlled space? Do they appear threatening, or friendly? Answering these questions can teach us a lot about the mechanisms behind the effectiveness of camera surveillance in preventing undesired behaviour. Moreover, stimulating people to behave at their best by invoking the impression of being watched, might even cause people to behave more pro-socially (i.e., engaging in socially desirable behaviours such as helping others; e.g., Govern & Marsch, 2001).

There are many methods to invoke a feeling of being watched, which are already widely used in practice. One is by introducing cameras to the environment, another is by letting people watch themselves, for instance through mirrors (e.g., Govern and Marsch, 2001). For example, many stores have installed a clearly visible camera monitor on which customers see themselves when entering the store. Also, throughout the store, people are often confronted with mirrors reflecting themselves. Furthermore, posters of eye images have been used to give the impression that people are being watched.

Research approach

The aim of this dissertation is to gain more insight in the psychological mechanisms behind undesired behaviour. Given that undesired behaviour occurs frequently, I try to shed light on the environmental factors that influence this process. I want to test the effects of these factors experimentally, and explore how modifying these environmental factors could be applied to the real world. Overall, I am curious to learn how the physical environment directs people's actions, specifically undesired behaviour, and how we can account for effects of environmental cues on undesirable behaviour in terms of the psychological processes involved. Additionally, I wonder to what extent different personality factors play a role in this context.

Research Questions

My dissertation focuses on the following question: *To what extent do social cues from the environment influence undesirable behaviour?* To answer this, my research will address the following sub-questions:

- To what extent does a disorderly environment influence undesired behaviour?
(Chapter 2)
 - How does personality (i.e., Locus of Control) play a role in this?
(Chapter 2)
- To what extent do cues of being watched influence behaviour?
(Chapter 2, 3, 4, 5)
 - How does personality (i.e., Self-Monitoring, Need for Approval & Social Value Orientation) play a role in this?
(Chapter 2, 3)
- What would be an effective way to implement cues of being watched?
(Chapter 2, 3, 4, 5)
 - How to effectively represent cues of being watched in an indoor setting?
(Chapter 2, 3)
 - How to effectively represent cues of being watched in an outdoor setting?
(Chapter 4, 5)

Methodological approach

I have chosen experiments as my main method of examination, since experiments allow a researcher to manipulate environmental circumstances and compare those reliably. An experimental setup allows us to design our conditions minutely, test whether these variations in conditions have the intended effects, and to make statements about cause-effect relationships. Studying undesirable behaviour in experiments is possible, if the behaviour is straightforward to observe and not too severe (which would make it un-ethical to provoke). I and my co-authors conducted five empirical studies, two in the lab, and three in the field. Within these experimental settings I manipulated several environmental factors, and observed the behaviour of the participants.

To study undesirable behaviour, I have focused my studies on both littering and cheating behaviour. Littering is a type of undesirable behaviour which is rather easy to observe, and occurs reasonably frequently. Cheating is a type of undesirable behaviour which is more serious and harder to observe and to invoke among participants. It is often used as a 'model behaviour' for dishonesty (Mazar, Amir, & Ariely; 2008) or other types of transgressions; since cheating is immoral, being frowned upon by others, and an offender will be sanctioned when caught (Tittle & Rowe, 1973; Tibbetts & Myers, 1999). However, while cheating is feasible to evoke and measure in a lab environment (see Gerlach, Teodorescu & Hertwig, 2019), it would be quite hard to measure in a field study. Therefore, I focused on littering in my field studies.

Although I focus on undesirable behaviour, one study exploring the effects of social control also takes effects on pro-social (i.e., desirable) behaviour into account. The suggestion of an audience might cause people to change their behaviour in such a way to gain the approval of others (Straham & Gerbasi, 1972; Gangestad, 1986), which could result in less undesirable behaviour, but also in more pro-social behaviour.

In my lab studies I tried to bring together environmental factors, such as disorder and cues of being watched, as well as a number of relevant personality factors - using a single experimental design. Importantly, lab experiments allow for measurement of personality factors which might moderate effects of environmental cues. As such, lab studies may contribute to a deeper understanding of the psychological processes involved. However, lab experiments are always taking place in a highly controlled environment, which might influence the occurrence of undesirable behaviour, since the presence of any kind of social control should theoretically deter undesirable behaviour (Clarke & Felson; 1993), even if this is evoked by the presence of the experimenter.

In my field studies I tried to translate my findings from the lab to a real-world setting. I used the methods which appeared to be effective in the lab, and combined these with techniques already applied in field studies by other researchers (i.e. Bateson, Nettle & Roberts, 2006; De Kort, McCalley & Midden, 2008). I designed prevention measures to test in the field, as this would be easy, relatively cheap, and convenient to apply in a real-world setting. Field experiments are conducted in a natural environment and are much less controlled. However, they are more suitable to study actual, real-life behaviours of the participants. With the field studies I could explore to what extent cues of being watched would impact naturalistic behaviour, with participants not being aware of participation in a research study. However, in a field experiment it is impossible to conduct individual questionnaires to record the personality traits of participants; and behaviour like cheating is hard to observe in a field experiment.

Outline of this dissertation

To answer the question of how disorder in the environment and the assumed presence of an observer influences the occurrence of undesired behaviour, I and my co-authors conducted four studies: two lab experiments which were both combined with personality questionnaires, and two field experiments. We conducted all of these experiments on the campus of the University of Twente, using students (study 1 & 2), both students and university personnel present on the campus grounds (study 3 & 4) and primary and secondary school children visiting the campus (study 5) as our participants. These five studies are represented in the following four chapters in this dissertation (see table 1.1).

In our first study, reported in Chapter 2, we tested whether a disorderly environment could have an effect of the occurrence of undesirable behaviour in a controlled indoor

setting. Additionally, we tested whether the presence of a camera would have an effect on behaviour. Next to littering, we focused on a type of undesirable behaviour often found in office and university settings: cheating (i.e. knowingly lying about results and numbers on paperwork and tests for one's own benefit). The effect of disorder has rarely been studied in indoor settings, and the effect of disorder on cheating has not been studied before. To examine possible interaction effects with personality, we included Locus of Control.

Chapter 2 aims to explore to what extent a disorderly environment influences undesired behaviour, and whether there might be a possible interaction with personality (sub-question 1). Chapter 2 also aims to get more insight in how the addition of social control to an office environment alters behaviour, and whether personality plays a role in that.

In chapter 3 I report our second experiment, in which we investigated whether the framing of camera surveillance would influence the effectiveness of the camera presence in preventing undesirable behaviour. We framed camera surveillance in several ways to examine if a watching authority might be more effective than a neutral camera, and whether a monitor on which people could see themselves would prevent undesirable behaviour. Similar to the first study, we tested this in an indoor environment. We compared three ways of framing the (implied) presence of others: a threatening way, stating authorities were watching and could intervene in the case of undesired behaviour; a neutral way, stating that unrelated researchers used the camera images for unrelated research; and another non-threatening way where the participants saw a live-feed of themselves on a screen before them. We also added a control situation without camera. To examine possible interaction effects with personality, we measured the personality traits Locus of Control, Need for Approval, Self-Monitoring and Social Value Orientation. Next to littering and cheating, we measured pro-social behaviour in this study: helping behaviour and donating money.

Chapter 3 aims to gain further insight in how social control can influence behaviour (sub-question 2). For this we investigated both undesirable and pro-social behaviour in an indoor office setting, using cameras as social control. We also explored the effects of personality, to examine whether there might be a possible interaction. We represented the cameras in different ways, to explore which would be the best way to represent this social control (sub-question 3).

In Chapter 4 we conducted a field study to test whether or not the effect of being watched could be achieved without the use of a camera. To this end, we used images of eyes, and tested the effect of these images on littering behaviour. Again, we framed these images in different ways to see whether the suggestion of authority would have a stronger effect compared to a neutral suggestion of being watched. With this set-up we wanted to use the principles we tested in the lab in a real-world setting, while reducing the risk of getting caught to zero. We distributed flyers on bikes at a bike parking spot at the university

campus. These flyers were inconveniently placed in such a way that participants would have to remove the flyer in order to use their bike comfortably.

Chapter 4 aims to gain additional insights in how social control can influence behaviour (sub-question 2). Yet, this time we explored undesirable behaviour in a public outdoor setting, using images of eyes as social control. We combined the images of eyes with cues of authority, to explore which would be the best way to represent this social control (sub-question 3).

With the studies reported in Chapter 5 we tried to extend the principles of the previous lab experiments to an outdoor situation, both in a social setting and in a group setting. We conducted two field experiments where we integrated a mirror and a security camera into the design of garbage bins used around the campus of the University of Twente. Each study had a different setting in which we tested the garbage bin designs: the first study involved adolescents who were visiting the campus for an event, the second study involved students and employees of the university who were familiar with the campus. For the first study we distributed a can of coke amongst our participants which could prompt littering, for the second study we handed out a flyer of a sports club. Subsequently, we observed participants' behaviour.

Chapter 5 aims to gain additional insights in how social control can influence behaviour (sub-question 2). Yet, this time we explored undesirable behaviour in a public outdoor setting, using both cameras and mirrors as cues of being watched. With these different types of cues, we tried to explore which would be the best way to represent social control (sub-question 3).

In chapter 6, I will conclude this dissertation with an overview of all studies, and present the reader with general conclusions in an attempt to answer the main questions of this dissertation. Additionally, I will reflect on the limitations of my studies, and suggest some approaches for future research. I will conclude this dissertation with an outline of implications for both theory and practice.

Table 1.1. Overview of the empirical studies in this dissertation

	Type of study	Environmental factors	Personality factors	Behaviour
Chapter 2				
Study 1: (N= 76)	Lab experiment combined with questionnaire	Disorder versus order & implied presence (camera)	Locus of Control	Cheating, Littering
Chapter 3				
Study 2: (N= 86)	Lab experiment combined with questionnaire	Framing of implied presence (cameras): authority, friendly, self-focused	Locus of Control, Need for Approval, Self-Monitoring, Social Value Orientation	Cheating, Littering, Pro-social behaviour
Chapter 4				
Study 3: (N= 944)	Field experiment	Framing of implied presence (eye images): authoritative versus friendly.		
Chapter 5				
Study 4: (N= 113) Study 5: (N= 596)	Field experiments	Garbage can designs: integrated mirror versus surveillance camera (implied presence)		Littering

Chapter 2

Order and Control in the environment

Exploring the effects on undesired behavior and the importance of locus of control

In this chapter, I and my co-authors test whether a disorderly environment could have an effect on the occurrence of undesirable behaviour in a controlled indoor setting. Additionally, we tested whether the presence of a camera would have an effect. We focused on both littering and cheating as a model for undesirable behaviour. To examine possible interaction effects with personality, we included Locus of Control.

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Physical factors in the environment can have a major influence on behavior; therefore this has been a popular area of research not only in environmental and social psychology, but also in many other domains. Environmental criminology for instance focuses on how environmental cues can influence or even induce undesired, norm-violating behaviors. As a result, many theories about the influence of the physical environment on (deviant) behavior have been devised within many different disciplines and viewpoints. This study aims to bring theories from psychology and criminology together, to aid in the overall understanding of the influence of the environment on undesired behavior.

The effect of disorder

Demonstrating the role that psychological processes play in occurrences of undesired, norm-violating behaviors, Cialdini, Reno & Kallgren (1990) showed that if litter is visibly present in an area, people tend to litter more because of an underlying mechanism which leads people to make inferences about social rules and prompts them to act accordingly. Cialdini et al. (1990) coined the term 'social proof' to describe this phenomenon. Generally, research shows that social proof exerts a powerful influence on behavior and that such influences generally occur outside of people's awareness, (see e.g., Nolan, Schultz, Cialdini, Goldstein & Griskevicius, 2008). These studies suggest that human behavior is -mostly automatically and subconsciously- influenced by behavioral traces in the environment (such as litter) because such traces reflect the behavior of other humans, and therefore are indicative for how one 'should' behave.

Prior to this, Wilson and Kelling (1982) had formulated the Broken Windows Theory (BWT) which suggests that signs of petty crime and disorder can trigger more serious crime in a neighbourhood. The BWT could now be seen as an extension of the social proof principle, arguing that environmental cues such as litter may not only trigger behaviors of the same kind (i.e., littering), but can also inspire other -potentially more serious- types of undesired behavior. However, the original line of reasoning of the BWT, as suggested by Wilson & Kelling (1982), assumes a more rational process of interpreting signs of disorder in the environment, while social proof assumes a subconscious influence of the environment on behavior. Wilson & Kelling propose that a disorderly environment signals the area is not actively monitored and people can break social norms with minimal risk of getting caught. This is consistent with the Rational Choice perspective (Cornish & Clarke, 1986), which states that an offender engages in a rational cost-benefit calculation before engaging in such behavior, contrasting the costs/risks and benefits of a particular action. The costs can be seen as the consequences of norm-breaking behavior, while the risk can be seen as the probability of getting caught (i.e. the presence of monitoring). Hence, a disorderly environment may signal a lower risk of detection, thus making it easier to engage in undesired behavior. Innes (2004) proposes 'signal crimes' and 'signal disorders' may be especially important in influencing the impression an environment may give about the safety of that area, regardless of how high actual crime rates may be. Signal crimes and signal disorders are acts of norm-violating behavior that leave a clear visual trace,

like graffiti or vandalism. Signal crimes and disorders might influence the perceived risk of getting caught which a possible offender could estimate from the environment, linking signal crimes/disorders to the BWT.

While the BWT is not without criticism (e.g., Harcourt, 2001; Harcourt & Ludwig, 2006), more recently Keizer, Lindenberg & Steg (2008) found substantial support for the idea that a disorderly environment (or traces of norm-violating behavior) might cause many different types of undesired behavior¹. In a series of field experiments conducted in public spaces such as alleys and parking lots, they demonstrated that a littered (or otherwise disorderly environment) not only affected littering but also increased the occurrence of other types of undesired behavior like trespassing and theft. For example, about twice as many people took money from an abandoned letter in a disorderly environment (littered or graffiti) compared to an orderly environment. They explained this spillover effect (the spreading of one type of disorder to other, different kinds of undesired behavior) using the 'goal framing theory', suggesting that if the goal to behave properly is contradicted by signs of disorder in the environment (remnants of rule-breaking behavior), the -ever present- goals to feel good (e.g., being lazy) or gain resources (e.g., stealing) become more salient. The goal framing theory hints at a more subconscious process of influence from the environment, in line with the 'social proof' principle suggested by Cialdini et al. (1990). While the goal framing theory is indeed an interesting explanatory mechanism, the experiments conducted by Keizer et al. (2008) mainly support the basic assumption of the BWT, not conclusively supporting nor disproving any underlying psychological mechanism.

In the current experimental study, we expand this line of research in four ways. First, we attempt to further unravel the underlying psychological mechanisms for the effects of environmental design by incorporating perceptions of social control. We aim at shedding more light on to what extent the process of environmental influence is mainly rational or (also) more subconscious. Secondly, and in Kurt Lewin's tradition, we examine the interplay between environmental cues and personality factors. Regardless of the relative persuasiveness of personal and (environmentally induced) social norms, we expect that the extent to which environmental disorder affects behavior partly depends on the personality of the person involved. The importance of taking into account dispositional factors when studying effects of environmental factors on human behavior has been acknowledged in environmental psychology (for examples, see Mehrabian, 1977 and Bloch, Brunel, & Arnold, 2003). We postulate that such a personality factor is Locus of Control (LOC; Rotter, 1966). Thirdly, we examine to what extent the spill-over of undesired behavior also applies to indoor, task related settings in which people spend a great deal of their time (e.g., at school, work, governmental institutions, etc.). Relatively little is known about effects of environmental cues on unwarranted behaviors in these

1 In this study we use the term 'undesired behavior' for different kinds of anti-social and criminal behavior like littering or cheating.

types of settings (see Ramos and Torgler, 2009 for an exception). Finally, we include a type of undesired behavior not yet studied in relation to environmental cues but which is nonetheless highly relevant and unfortunately very prominent in many task settings - deception. As discussed, in indoor and office settings undesirable behaviors may not include obvious crimes, however they do include unwarranted behaviors such as providing incorrect or false information, littering, impoliteness towards customers, fraud and other forms of white-collar crime. We will look into the effect of a disorderly environment on the likelihood that people will cheat or deceive others. This category of behavior is usually labeled as deception, and can easily be considered to be a deviant behavior (Tibbetts & Myers, 1999). The challenge is to what extent mirroring of behavior as well as the spillover effect will manifest itself in controlled indoor settings. An office environment is less anonymous compared to an outdoor setting, and people may experience higher levels of social control in general.

Before presenting the details of this study, we will first elaborate on two psychological dimensions which might play a role influencing the spill-over effect as described by the BWT: the perception of social control (situational influence) and the influence of personality, specifically locus of control (dispositional influence).

The perception of social control

Theory and research suggest that social control, ranging from the watchful eyes of neighbors to camera surveillance, plays an important role in keeping disorder and crime at bay (e.g., Sampson, Raudenbush & Earls, 1997; Hirschi, 2002). In public places and in many cities around the world, social control has primarily been induced by implementing camera surveillance or Close Circuit Television (CCTV). The reasoning behind this is that surveillance cameras may both prevent crime by signaling that one is being watched, as well as increasing the likelihood that one is caught in case of law-breaking behavior. Several studies (e.g., Priks, 2007; Poyner, 1992) do indeed suggest that the presence of cameras decreases undesired behavior. We expect camera surveillance to be especially effective when a rational process of cost/benefit estimation is involved, linking back to the rational choice perspective (Cornish & Clarke, 1986).

However, besides increasing the perceived chance of getting caught, observation might have additional effects: research by Bateson, Nettle and Roberts (2006) suggests that at least part of the effect of social control might be explained by the 'feeling of being watched', as opposed to the anticipation of the consequences of being monitored by others. Bateson et al. showed that the mere presence of an image of a pair of eyes -in contrast with an image of flowers- led to significantly more donations to an 'honesty box' for self-service drinks in a university coffee room. As the probability of detection was the same across conditions, their findings suggest that a purely rational cost-benefit analysis is unlikely to explain the effects observed. Furthermore, a recent indoor study by Van Rompay, Vonk and Fransen (2009) also suggests that camera surveillance may not

only prevent unwarranted behaviors but also stimulates desirable helping behaviors – in this case, helping a confederate of the experimenter pick up a pile of papers ‘accidentally’ dropped on the ground. This study demonstrates that even when the chance of detection is irrelevant (since there is no undesired behavior), the presence of a camera can still affect behavior.

Taken together, these findings suggest that undesired behavior could be significantly reduced when a form of social control (or the feeling of being watched) is introduced into the environment, counteracting the possible detrimental effects of a disorderly environment on behavior. In the current research, we are specifically interested in the effect of social control/feeling of being observed (as a prime), without the risk of being caught interfering. Therefore we took great care to minimize the perceived chance of possible detection of cheating, while still being clear to the participants that they were being observed during the experiment by having a camera present (versus absent) in the indoor office setting where the tests took place.

The impact of personality: Locus of Control

The current research proposes that reactions to environmental factors may vary with the extent to which people believe (or not) that the outcome of events results primarily from their own doing, a trait referred to as locus of control (i.e., LOC, Rotter, 1966). Generally, people with an internal LOC feel in control of their own lives, while an external LOC entails that people feel their lives are guided by external factors, such as fate or the actions of others (Rotter, 1966). As the environment can also be considered an external factor, individuals with an external LOC may be more attuned to signs of implicit behavioral standards originating from the environment than individuals with an internal LOC.

In line with this, research by Forte (2004) suggests that people with an internal LOC decide for themselves what is appropriate behavior, while people with an external LOC have external reference points to decide what is appropriate or not. Similarly, Guagnano (1995) suggests that people with an internal LOC feel more responsible for their own actions. Based on these findings, we expect environmental cues – such as the (dis)order in the environment – to elicit stronger effects for individuals with an external rather than an internal LOC.

The previous discussion leads to the following hypotheses:

- Hypothesis 1:* Littering will be higher in a disorderly rather than orderly office environment.
- Hypothesis 2:* Cheating will be higher in a disorderly rather than orderly office environment (spill-over effect).
- Hypothesis 3:* The presence of a camera will inhibit the detrimental effect of a disorderly environment on undesired behavior.
- Hypothesis 4:* Participants with an external LOC will be more strongly influenced by the environment than participants with an internal LOC.

These hypotheses are tested in an indoor office setting using a 2x2 factorial design, with disorderly / orderly environment and camera / no camera as independent variables and cheating and littering as dependent variables.

Method

Participants and design

A total of 76 Bachelor students of psychology and communication studies at the University of Twente in the Netherlands participated in our research for partial course credit. Participants varied in age from 18 to 35 years (mean = 21, Standard Deviation = 1.9). The sample consisted of 26 men and 50 women. The design was a 2 (room: orderly versus disorderly) by 2 (camera: present versus not present) factorial design. Participants were randomly assigned to the experimental conditions (no camera no litter: N=19, no camera with litter: N=19, with camera no litter: N=18, with camera with litter: N=20). Participants' LOC was established about two weeks prior to the experiment, and we included a post-experiment questionnaire to gain more insight into underlying processes.

Procedure

Participants were invited to one of two adjacent offices, one of which was orderly and one disorderly. Both rooms had similar office furniture, but the furniture of the disorderly room looked dated, with graffiti and scratches on the desk and table. To give the impression that the disorderly room was neglected, clutter (e.g., old newspapers, print-outs and empty cups) were spread around the room, boxes filled with clutter were standing around, the floor was dirty (dust, coffee stains and pieces of paper), and the garbage bin was partly filled. The orderly room looked neatly organized, was cleaned daily, and the trash taken out daily (see figure 2.1). Each room had a black-and-white poster with an orderly or disorderly situation pictured on them, placed in the corresponding condition. Directly at the start, the participants were offered something to eat (i.e. a bowl containing cookies, chocolates and mints) and a drink (tea, coffee or water). Food and drinks were provided in a disposable wrapper or cup. Participants were informed that they needed to complete two tasks, each of which lasted for about 10 minutes. They were told that the tasks tested their ability to solve puzzles by creative thinking, and were informed that they could earn money by completing the tasks; the more puzzles they would solve, the more money they would earn.

In those conditions for which a camera was present, participants were informed of this. The camera was located next to the participant at their left hand side, at eye level. It was pointed at the upper body and face of the participant, so it could view the participants working on the tasks (but positioned at such an angle that it could not explicitly detect cheating). Participants were told the purpose of the camera was to enable them to make contact with the experimenter in case they wished to (i.e. when they would run into a problem), and they

were instructed to wave to the camera to notify the experimenter when they completed their task. When no camera was present, participants were told they could knock on the door of the adjacent room if they needed help or if they had completed their tasks.

Figure 2.1.

a. Orderly room

b. Disorderly room

The first task participants completed was a computer task where they had to find two numbers in a matrix of 12 that sum to ten. This test, based on Mead et al. (2009), was slightly adapted for execution on a computer. Matrices were displayed one at the time; with a break of one minute every five matrices. There was only one solution possible per matrix, and participants were informed they could earn 20 eurocents for every correct solution. They could skip a puzzle if they could not find the right solution. Their score (the number of puzzles of which they found the correct solution) was displayed on the upper-right corner of the screen. Participants were given 10 minutes to correctly solve as many puzzles as they could, but a crash was staged at 9 minutes and 30 seconds. Before participants started this task, they were told that the experimenters occasionally encountered problems with the computer program. They were instructed not to worry if this happened, but that the program would not save anything, and therefore they were asked to keep track of their score. After participants reported the crash to the experimenter, she apologized for the inconvenience and indicated there was nothing to worry about, since the participant had kept track of their own score, as instructed. The experimenter subsequently wrote down the number of correct answers the participant indicated. Afterwards, this number was compared to the number of correct answers the program had recorded.

The second task consisted of 21 anagrams. These were printed on cards; with the anagram on the front, and the solution on the back. Participants were instructed to solve each anagram in 30 seconds. Every 30 seconds they heard a beep after which they were instructed to turn the card and indicate (on paper) if they had found the right solution. This test is based on Eisenberger et al. (1985), with the exception that we used Dutch and German anagrams (corresponding to the student's native language) developed in a pretest phase. Participants were told they could increase the money earned by the first task by 50% if they got 16 or more anagrams correct. However, the task was set up in such a way

that only 15 anagrams could be solved. Those anagrams were relatively easy to solve, and had all been solved in each of the pre-tests (conducted on a different group of students). The remaining words were gibberish; pre-tests confirmed they were un-solvable.

Overall, participants had the opportunity to cheat on both tasks, which could be ascertained after the experiment had ended. To quantify littering, at the end of the experiment, the experimenter wrote down whether the disposable drinking cup and food wrapper were thrown in the garbage bin (which was in eye sight in both rooms) or left behind in the room. After the experiment, participants were accompanied to another room and completed a short questionnaire. Participants were de-briefed via email.

Measures

Behavioral Outcome Measures

The main dependent variables were 'littering' and 'cheating'.

'Littering' was a dichotomous variable, coded as 1 if the participant left any trash behind, and zero otherwise. Seven participants did not eat or drink during the experiment; those were coded as missing values. We consider the missing values to be 'missing at random', because they were randomly distributed over the conditions.

For cheating, we initially recorded the exact amount of cheating on both tasks. However, since there was very little variation in the amount of cheating, we decided to use a dichotomous variable representing cheating versus not cheating. As such, a total of 24 of the 76 participants cheated during the experiment.

Locus of Control

About two weeks prior to participating in the experiment, participants completed a number of personality questionnaires. The two parts of the study were presented as two different projects which were combined for practical reasons. One of the personality questionnaires was the 'Rotter Internal-External Control scale' (Rotter, 1966), which has been used in this study to measure Locus Of Control. The Rotter IE scale consists of 23 items, each of which gives the participant the choice between two options; for example: a) "When I make plans, I am almost certain that I can make them work" (internal LOC, score '0') and b) "It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow" (external LOC, score '1'). All answers were counted, producing individual scores ranging between 0-23. The scale had good internal consistency, with a Cronbach's α of 0.78. The mean and the standard deviation of this variable are, respectively: 11.66 and 4.52.

Control Variable: Depletion

Research has shown that depleted people cheat more easily on tasks compared to non-depleted people (Mead et al., 2009). It is possible that a cluttered environment or the presence of a camera contributes to depletion, therefore we measured ego-depletion after

the experiment (depletion of mental resources, thus making people more susceptible to falling back into hedonistic-type behavior; e.g., Janssen, Fennis, Pruyn, & Vohs, 2008; Mead, Baumeister, Gino, Schweitzer and Ariely, 2009) to examine this issue. We used a short version (6 items) of the State Ego Depletion Scale to measure depletion (SEDS, Janssen et al., 2008). An example item is: "I feel mentally exhausted". The items were measured on a scale ranging from 1 ('not at all') to 7 ('very much') (Cronbach's $\alpha = 0.76$; Mean: 3.12, SD: 0.87).

Results

First we present analyses of participant's responses to the short questionnaire to see if they had perceived disorder in the room, and whether they were aware of the presence of the camera. Next, we focus on the main effects of disorder and the presence of a camera on littering and cheating, followed by the interaction effects adding Locus of Control to the equation. Finally, we present additional analyses to explore observed patterns further.

Manipulation checks

Directly after the experiment we gave participants a questionnaire to check if they had perceived disorder in the room, and whether they were aware of the presence of the camera; our manipulation checks.

The perception of disorder was measured with five items; e.g., "The room was untidy" on a scale ranging from 1 ('not at all') to 5 ('very much') ($\alpha = 0.67$; Mean: 2.54, SD: 1.00). A 2 x 2 ANOVA only revealed a significant main effect of disorder on the perception of disorder: $F(1,76) = 71.07, p < .001$. As expected, the participants perceived more disorder in the disorderly environment ($M_{\text{disorder}} = 3.22$ vs. $M_{\text{order}} = 1.83$).

As for camera presence, two analyses were conducted to ensure the effectiveness of the social control manipulation. First, people's awareness of the camera was checked by asking if they knew there was a camera in the room; "If problems arise, I can wave to the camera in the room", yes/no. All participants answered this question correctly. Second, to test whether camera presence heightened feelings of social control, a four-item social control measure was used to assess if people felt observed during the experiment (e.g., "I felt like I was being watched during the anagram task"). The items were measured on a scale ranging from 1 ('not at all') to 7 ('very much') ($\alpha = 0.85$; Mean: 3.85, SD: 1.41). A 2 x 2 ANOVA revealed a significant main effect of the presence of a camera on social control, $F(1,76) = 4.16, p = .040$, indicating that the manipulation of social control by means of camera presence was successful ($M_{\text{camera}} = 4.08, M_{\text{no camera}} = 3.43$).

Effects of disorder

To test whether there was a main effect of disorder on littering and cheating, a series of chi-square tests was conducted. We found that 47% of the participants littered in the

orderly situation, compared to 74% in the disorderly situation, a significant difference ($\chi^2(1, N = 69) = 5.37, p = .021$). The odds of littering increased by a factor of 3.25 in the disorderly situation compared to the orderly situation (OR 3.250, 95% CI: 1.179 - 8.958). There was no main effect of disorder on cheating (not significant: $\chi^2(1, N = 76) = .69, p = .406$; OR 1.512, 95% CI: .569 - 4.016): 27% of the participants lied in the orderly situation, compared to 36% in the disorderly situation.

The effect of a camera

Our next step was to test whether the presence of a camera inhibits littering and cheating. We conducted chi square tests with camera/no camera versus littering and cheating as variables. There were no main effects of the presence of a camera: for littering $\chi^2(1, N = 69) = .892, p = .345$ (OR 1.600, 95% CI: .602 - 4.254), nor for cheating $\chi^2(1, N = 76) = .974, p = .324$ (OR 1.633, 95% CI: .614 - 4.342). In percentages: 67% of the participants littered in the presence of a camera, compared to 56% in the condition without a camera; 37% of the participants cheated in the presence of a camera, compared to 26% in the condition without a camera.

Interaction effects of (dis)order, camera and I/E LOC

To test whether LOC moderates the effects of the environment we performed logistic regression analyses with order/disorder, camera/no camera and LOC as independent variables, and littering and cheating as dependent variables. The continuous variable of I/E control was centered to reduce intercollinearity with the interaction term and the categorical variables were re-coded to -0.5 and 0.5 for order/disorder and camera present/not present.

Besides the previously reported main effect of disorder on littering, there were no other main effects. However, the results did reveal an interaction effect of order/disorder and internal/external locus of control on cheating (see Table 2.1 & 2.2). We did not find any other interaction effects.

Table 2.1. Logistic regression of the interaction between Locus of Control (LOC) and condition (order/disorder) on lying.

Predictor	β	$SE \beta$	Wald's χ^2	df	p	e^β
Constant	-1.013	.296	11.694	1	.001	.363
Order/disorder	.731	.592	1.524	1	.217	2.077
Locus of Control	-.106	.077	1.916	1	.166	.899
Order/disorder * Locus of Control	.384	.154	6.253	1	.012	1.468
Test			χ^2	df	p	
Omnibus test of model coefficients			8.610	3	.035	
Hosmer & Lemeshow goodness-of-fit test			3.006	7	.884	

Model summary: -2 Log likelihood = 86.186, Cox & Snell $R^2 = .107$, Nagelkerke $R^2 = .150$

Table 2.2. Test of the regression model on the prediction of lying.

Observed	Predicted		% Correct
	No	Yes	
No	47	5	90.4
Yes	20	4	16.7
Overall % correct			67.1

Note: Cutoff of 0.50

We conducted separate Chi-square tests of the groups with internal and external LOC based on a median split on score 11.5 ($N_{I-LOC} = 41$; $N_{E-LOC} = 35$). When cheating/not cheating in the disorderly and the orderly environments are compared, the results showed in line with predictions that significantly more participants with an external LOC lied in a disorderly environment (40%, 8 of 20) compared to an orderly environment (7%, 1 of 15): $\chi^2 (1, N = 35) = 4.99, p = .026$ (OR 9.333, 95% CI: 1.016 – 85.698). No such effect was observed for participants with an internal LOC: 32% (6 of 19) lied in a disorderly environment, 41% (9 of 22) lied in an orderly environment ($\chi^2 (1, N = 41) = .383, p = .536$; OR .667, 95% CI: .184 – 2.416), see figure 2.2.

Figure 2.2. The interaction between Locus of Control (LOC) and condition (order/disorder) on lying (proportion of participants who lied).

Figure 2.2 reveals an interesting issue: in an orderly environment, more participants with an internal LOC appear to cheat (41%, 9 of the 22 persons with an internal LOC in that condition), compared to participants with an external LOC (7%, 1 person of the 15). A chi-square test which compared the participants with an internal LOC to participants with an external LOC in an orderly room did indeed reveal a significant difference: $\chi^2 (1, N = 37) = 5.30, p = .021$ (OR .103, 95% CI: .011– .931). There was no significant difference in cheating between participants with an internal LOC (32%, 6 out of 19) and participants with an external LOC (40%, 8 out of 20) in the disorderly room (not significant: $\chi^2 (1, N = 39) = .300, p = .584$; OR 1.444, 95% CI: .387 – 5.394).

Additional results

To examine the role of the perception of disorder we performed a logistic regression analysis with 'perception of disorder' (replacing order/disorder) and LOC as independent variables and littering and cheating as dependent variables. This did not yield any significant main or interaction effects. We will come back to this finding in the discussion section.

Furthermore, to explore possible differences between people who cheated and those who did not, we conducted post-hoc analyses with cheating as an independent variable. A significant interaction-effect of camera and cheating on depletion was found, $F(1,76) = 5.16$, $p = .026$. As shown in Figure 2.3, univariate ANOVAs revealed that participants who cheated were more depleted after the experiment if a camera was present during the experiment, $F(1,24) = 5.15$, $p = .033$, while there was no effect for individuals who did not cheat ($F(1,52) = 1.38$, $p = .246$).

Figure 2.3. The interaction between condition (camera/no camera) and lying on depletion.

As an alternative explanation for possible effects of disorder on undesired behavior we considered mental depletion. An ANOVA revealed no significant effects of the manipulations on depletion, and a set of logistic regressions did not show a significant effect of depletion on littering or cheating.

Discussion

As we are often confronted with disorderly environments in everyday life, it is important to know how these environmental features may influence behavior and more specifically, why. Here, we tested whether or not littering would be higher in a disorderly than orderly office environment; if cheating would be higher in a disorderly than orderly office environment (spill-over effect); if the presence of a camera would inhibit the detrimental effect of a

disorderly environment on undesired behavior; and whether or not participants with an external LOC would be more strongly influenced by the environment than participants with an internal LOC. Our findings provide support for the effect of social proof (Cialdini et al., 1990): people littered more in a disorderly, messy environment. Furthermore, we also found a spillover effect to cheating, but only for individuals who had an external rather than an internal locus of control.

While some studies (eg. Keizer et al., 2008; Ramos & Torgler, 2009) found a main effect of a disorderly environment on different kinds of undesired behavior, this was not the case here. One explanation might be found in the setting used, which was considerably different from previous research on disorder in the environment. That is, previous research focused on settings in public places where participants are not aware of being part of a research project and may consider themselves relatively anonymous (e.g., Keizer et al., 2008). It might well be that such circumstances may more easily seduce people to exhibit undesirable behavior of any kind and nature. It is also possible that the generally considered more severe behavior of cheating to earn more money is not so readily influenced by a disorderly environment as other unruly types of behavior, for example the ones measured by Keizer et al. (2008; e.g., trespassing or taking money from an apparently lost letter).

Thus, on one hand, our research shows that the spill-over effect of undesired behavior does occur in a more contained, task-related, setting, which adds to the external validity of the effect of disorder and points at its relevance for non-public domains as well (e.g., the work domain). However, our findings also suggest that the crossover to another type of undesired behavior like cheating requires an extra 'push'; the more distinct a type of behavior is from the behavior observed in the environment, the more 'push' is needed to induce that behavior. Since an external LOC indicates a higher susceptibility to the environment, this personality factor might provide such a push.

In research on cheating, LOC is widely used to explain the prevalence of cheating. Different studies render contradicting results (e.g., Whitley, 1998; Crown and Spiller, 1998), but studies do consistently find that people with an internal LOC cheat more on tasks based on skill, while people with an external LOC cheat more on tasks based on luck (Whitley, 1998). In the current study a skill-based task was used, and while we did not find a significant main effect of LOC on cheating, the prevalence of cheating was indeed significant higher for participants with an internal LOC compared to participants with an external LOC, but only in an orderly room (see Figure 2).

We did not find any effects of camera surveillance on littering or cheating among participants. Thus, our results indicate that merely the presence of a camera might not prevent undesired behavior, at least not in the specific setting we used. It is possible the presence of a camera didn't add much more social control to an already strictly

controlled setting. Because the camera was presented as a way to keep in contact with the experimenter, participants could have considered it as simply another research tool in the environment. In fact, during the experiment the participants seemed to forget about the camera (e.g., they picked their nose or cursed at the computer), until they needed it to signal the experimenter.

Interestingly, our results revealed that the presence of a camera did influence the notion of being watched, but this did not stop our respondents from littering or cheating. Additionally, our finding that people who lied were more depleted when there was a camera present indicates that the presence of a camera did have an effect, albeit not on a behavioral level. Future research is needed to further explore the conditions under which the presence of a camera might prevent undesired behavior. One option for further research would be to make the presence of the camera and the possible consequences of unruly behavior more salient.

A note on small scale exploratory studies and sample size

While 15-20 participants per group are common for these types of small-scale exploratory lab studies in social and environmental psychology, we do realize the number of participants in this study is rather low. The potential problem with a small sample size is that patterns (indicative of relationships between independent variables and dependent variables) may not come to the fore due to limited statistical power. A non-significant effect cannot be taken as a proof that an effect does not exist, only that it could not be detected within the study (e.g., Hoenig & Heisey, 2001).² We limited the duration of the experiment (and therefore the number of participants) for practical reasons, primarily to avoid participants discussing differences in experimental conditions which would have confounded the results.

We did not perform a power analysis before we started our study, because in order to conduct a pre-experimental power analysis, it is necessary to make assumptions about expected effect sizes. In these kinds of experiments, such estimates are difficult to produce as there is no way to reliably predict an effect which is strongly environment / situation dependent (see also: Iacobucci, 2001). Neither did we conduct a post-hoc power analysis, because post-hoc power analyses are mainly useful for planning future experiments (Hoenig & Heisey, 2001).

However, it is usually only with respect to marginally significant results -i.e., p values between .05 and .10- that an increase in sample size might matter in so far as patterns could more easily reach significance as power of the analysis increases. In this study, we

2 Concerns along this line of reasoning have even led to a publication bias in psychology, leading to negative correlation between effect size and sample size in published studies; see Kühberger, Fritz & Scherndl (2014).

did not find any marginal effects. Moreover, we have reported the p-values as well as odds ratio (effect size) and their confidence intervals to provide further insight into the results. We do think that the findings of this study (i.e., the significant results contrasting with the non-significant results within the scope of this study), especially the interaction of environmental factors and personality factors, bear insight and scientific value to research in this field. We hope to inspire researchers to further explore this aspect in experiments with a larger scope.

Practical implications

In recent years, research pertaining to crime, criminal and undesired or anti-social behavior has shifted from a focus on the personality of offenders towards more practical applied research that incorporates effects of environmental and situational factors too. At the same time, studies in environmental psychology have pointed toward the influence of the direct physical environment on (undesirable) behavior. The environment is something that is relatively easy to manipulate, and policy could (and probably should) be adjusted to this end. The current research started out as an attempt to integrate these two fields of research in order to further spell out the exact nature of the psychological processes involved. Underlying the feasibility of such an approach, this study illustrates that merely focusing on either personality or environment might not enable one to truly understand the mechanisms underlying undesired behavior. Our results may lead to a more fine-tuned way of applying environmental policies, and further understanding of the psychological process behind situational crime prevention (Clarke, 1997; Homel, 1996).

Admittedly, the findings of this study reveal only a small aspect of the psychological mechanisms behind environmental influence and norm-violating behaviors. Further research is required to further understanding of the intricate relationships between environment, psychology, and norm-violating behaviors.

Chapter 3

The Influence of camera presentation on behavior

The influence of the presentation of camera surveillance on undesired and pro-social behavior

In the previous chapter, we expected an effect of the presence of a camera, but we found no effect. Subsequently, in this chapter we investigated whether the framing of camera surveillance would influence the effectiveness of the camera presence in preventing undesirable behaviour. We framed camera surveillance in several ways, to see if framing would help in preventing undesirable behaviour. Similar to the first study, we tested this in an indoor environment. To examine possible interaction effects with personality, we measured Locus of Control, and added Need for Approval, Self-Monitoring and Social Value Orientation. Next to littering and cheating, we measured pro-social behaviour in this study: helping behaviour and donating money.

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Camera surveillance is widely used in western countries, and its use is ever increasing. Cameras are often placed as a means to ensure that criminals and vandals are easier to trace, but according to Welsh & Farrington (2009), camera surveillance could also be seen as an instrument of situational crime prevention. The question is, however, to what extent the presence of cameras truly has a preventive effect on undesirable behavior, and whether a possible preventive effect would also apply to camera surveillance in different environmental situations, specifically in indoor settings.

Various studies have also shown that the preventive effect of cameras on undesirable and criminal behavior is not straightforward. For example, the meta-analyses of Welsh and Farrington (2002, 2009) show divergent results (i.e., in some places or situations cameras do seem to work, in other situations they do not), calling into question whether camera surveillance should be considered a dependable method of crime prevention. These meta-analyses show that the (environmental) context is an important factor to reckon with; for example, camera surveillance seems more effective in car parks compared to other settings (such as town centers and public housing communities). Studying how and why camera surveillance works and whether the presentation of, and notifications about, the camera surveillance influences its effectiveness might give more insight in the reasons why these meta-analyses show such a wide range of results.

Of particular relevance in this context are long-standing research findings from the social and behavioral sciences which testify to the importance of ‘framing’; the presentation and communications surrounding objects and information, possibly changing the attitudes of the public toward it (see Nelson, Oxley & Clawson, 1997). In the current research we will focus on the communications surrounding camera surveillance, aimed at informing the public about the camera’s purpose. Framing of camera surveillance is often implemented by signs or posters informing the public about the presence of surveillance cameras, or by voice messages; for instance at train or metro stations. These signs, posters or messages may differ on various aspects (e.g., length or specificity), but arguably one of the most important factors influencing the effectiveness of camera surveillance involves whether or not the camera surveillance is presented in an intimidating or friendly manner to the public, or if awareness of their behavior is invoked. For instance, signage may stress the notion of being watched by an authority in an intimidating manner, or it may rather convey friendliness or helpfulness and stress the notion that CCTV is there for civilian safety.

Accordingly, one way of furthering insights into the effectiveness of camera surveillance might involve differentiation between different ways in which CCTV is framed to the public. Surprisingly, the influence of the framing of camera surveillance on the effectiveness of camera surveillance in influencing undesirable behavior has not been researched as of yet, yet it could be a valid explanation for the pronounced differences found in the effectiveness of CCTV in different studies. In the current study we examine three types of framing originating from different theoretical perspectives in a controlled

experimental setting. As such, we explore and integrate theories from criminology with theories from social and environmental psychology. Additionally, we will focus on both interpersonal and intrapersonal processes to gain further insights into effects of camera presence and framing thereof on behavior.

In this study we will focus our examination on indoor settings. As mentioned before, many studies on the effectiveness of camera surveillance are conducted in outside, public spaces (see Welsh & Farrington, 2009). However, in recent years, cameras are also increasingly used in indoor settings such as shops, casinos, public spaces, governmental institutions, office environments and educational settings. In these type of settings, people often perform tasks or activities where cheating might occur (e.g., when completing a test or filling out a tax form). Importantly, the presence of camera surveillance in indoor environments might influence such unwarranted types of behavior. Additionally, people often interact and assist each other in these types of settings, and the presence of the watching eye of a camera might have an effect on pro-social behavior too. However, as of yet, research assessing effects of CCTV in indoor areas on these types of behavior is scarce.

A notable use of indoor camera surveillance is within the home of students enrolled in online courses, in order to prevent cheating during electronic exams (Eisenberg, 2013). In fact, some online learning institutions, like Coursera, offer courses (taught by professors from various prestigious universities) through which students can earn actual college credits. This raises the question how accurate the results of electronic tests are when they are taken from the student's home. There are several methods of preventing cheating at electronic exams, including camera feeds watched remotely, capturing and streaming the screen of the students, and recording keystrokes and mouse clicks (Bawarith, Basuhail, Fattouh, & Gamalel-Din, 2017; Sarrayrih, & Ilyas, 2013).

When contemplating differences between indoor settings (including office buildings or in family home settings) and outdoor surveillance (e.g., streets or secluded parking garages), the feeling of being watched is arguably one of the most distinguishing features. That is, people would feel more like they are being watched or observed in indoor environments compared to outdoor environments, which could reduce the preventive effect of camera surveillance (often attributed to this feeling of being watched). Arguably (and of particular relevance to the current research) such perceptions and feelings are dependent on how camera presence is framed by means of notifications or information messages accompanying CCTV. Manipulating the context of the camera surveillance could increase its effectiveness. Additionally, implementing and manipulating the notifications accompanying the presence of the cameras is more straightforward and more noticeable in an indoor setting than in an outdoor setting.

In addition to preventing crimes such as shoplifting or vandalism, in indoor settings, smaller (but nonetheless troubling) crimes such as cheating and fraud (e.g., filling out incorrect or

false information on forms or tests) and antisocial behaviors (e.g., being rude and unwilling to help others) may also be targeted. In the current undertaking we will therefore study effects of camera surveillance on cheating and occurrences of pro-social behaviors.

The current research

Central to this research is the notion that cheating can be seen as a type of dishonest behavior to further selfish goals. Cheating has many parallels to other types of dishonest behavior: cheating is immoral, is being frowned upon by others, and an offender will be sanctioned when caught (Tittle & Rowe, 1973). In our study, participants could earn extra money dishonestly if they decided to cheat, so in this case cheating could be seen as a variant of stealing. As for pro-social behavior, three different types of behavior were studied. We used the cleaning up of (their own) trash, which has been studied extensively before, to be able to compare our findings with other studies. Additionally, we used a voluntary donation for a good cause, because charitable giving has also been used previously as a measure of pro-social behavior (e.g., Twenge, Baumeister, DeWall, Ciarocco & Bartels, 2007; Van Rompay, Vonk and Fransen, 2009). Finally, we studied helping behavior by investigating the extent to which participants helped out the experimenter with picking up dropped items from the floor after a minor mishap (a similar measure as used in Twenge et al., 2007, and in Van Rompay et al., 2009, where participants could help an experimenter to collect dropped papers, either with or without a security camera present). Before presenting further details of this study, we will first elaborate on the processes underlying camera surveillance, drawing both from criminal and psychological frameworks.

A multi-disciplinary approach to camera surveillance

While criminological theories focus mainly on the prevention of criminal behaviors such as vandalism and theft, most psychological theories assume a broader spectrum of behavior that might be influenced by the presence of cameras. For example (in a social psychological approach), the social impact theory by Latané (1981) states that the real or imagined presence of others can be regarded as a social force, affecting emotions, impressions, values and ultimately, behavior. Expanding on this reasoning, camera presence could affect both undesired behavior as well as desired, pro-social behavior.

In the current study we will examine various types of cheating in addition to three different types of pro-social helping behavior; namely cleaning one's trash, helping another person and donating to a charity.

The first approach we take in investigating how camera surveillance can affect behavior focuses mainly on the prevention of undesired behavior, and is based on the Rational Choice perspective of Clarke and Felson (1993) (also see: Cornish & Clarke, 1986, 2008). This criminological perspective assumes that most criminal behavior is the result of a rational assessment of the costs and benefits of a certain action. Based on that perspective,

people would only engage in deviant behavior when the benefits outweigh the costs (Braga, 2010; Cornish & Clarke, 1986, 2008). Since the presence of security cameras enhances the risk of being caught, this should lead to a decline in deviant behavior. This consideration is also evident in the Routine Activity Theory (Felson, 1998, 2006; Cohen & Felson, 1979), which is a derivative of the Rational Choice perspective. The Routine Activity Theory states that one of the three factors that could prevent the occurrence of a criminal incident is the presence of a capable guardian. According to the Social Control Theory (Hirschi, 2002), which is a complementary approach, this capable guardian should be perceived as an authority figure who has the ability to punish, thus placing strong emphasis on the probability of detection and the risk of punishment. Many studies do indeed suggest that deterrence caused by the threat of punishment is an important factor in reducing crime (eg. Braga & Weisburd, 2012; Akers, 1990). The effect of an authority watching is demonstrated in a study by Sigelman & Sigelman (1976), which shows that the presence of an uniformed authority figure significantly decreases rates of traffic violations.

The presence of a security camera could fulfill the role of a guardian, since camera surveillance is a channel through which authority figures could monitor actions or events unfolding, leading to increased risk of detection and punishment. Levine (2000) did indeed state in his study on the effects of security cameras on public behavior that -in order for camera surveillance to be effective-, people should 1) be aware they are being monitored, 2) know who is watching, and 3) know which types of behaviors are punishable. Following this line of reasoning, it is thus important that camera surveillance is salient, and framed in such a way so that people have the impression that an authority figure is watching, who has the ability to punish deviant behavior.

Interestingly, Van Bommel, Van Prooijen, Elffers, & van Lange (2014) have found a surprising interaction effect of camera presence on helping behavior: without bystanders present, people seemed to intervene less often when money was stolen from a (confederate) victim when a security camera was present. This implies that individuals become *less* helpful in the presence of authoritative camera surveillance. Levine (2000) suggests this is the case because people feel less responsible to help others when they think an authority is keeping watch, a principle referred to as 'diffusion of responsibility' (Darley & Latané, 1968). Together, this leads to the following hypotheses:

Compared to a control situation without camera presence, both cheating (1a) and pro-social behavior (1b) will be discouraged when camera surveillance is presented in a salient and intimidating manner, enhancing the notice of a watchful authority capable of punishment.

The second approach we take in order to explore how camera surveillance might influence behavior is based on psychological theories, mostly focusing on pro-social behavior and interpersonal processes. We mentioned before that the social impact theory by Latané (1981) implies that even the imagined presence of others (i.e., when a camera is 'watching')

can be regarded as a social force, ultimately affecting behavior. A possible explanation for this phenomenon is that the presence of others (real, anticipated or imagined) may induce the feeling of being evaluated, encouraging self-evaluation and impression-management (Leary & Kowalski, 1990), which might result in behavior adjustments with the aim of presenting a socially-desirable image to the outside world. A typical category of norm-congruent behavior that is likely to carry away others' approval, is pro-social behavior (Kallgren, Reno, & Cialdini, 2000), or 'helping others'. If the presence of a camera evokes the feeling of being evaluated by others, pro-social behavior might be encouraged.

Govern and Marsch (2001) do indeed state that camera presence might encourage people to represent themselves well to an audience, presumably because a watchful eye increases self-awareness in their study. Similarly, Van Rompay, Vonk and Fransen (2009) suggest that people observed by cameras feel that their behavior is being evaluated, and hence might adjust their behaviors in accordance with social norms. Findings from their study indeed showed that people were more willing to assist others when a camera was present and visible. Further underscoring the importance of impression management behaviors in relation to camera surveillance, findings further showed that this effect only surfaced for people with a strong need for the approval of others, and only in relation to behaviors that can actually be observed by cameras.

Based on the Social Impact Theory (Latané, 1981) we assume that undesired behavior would likewise be affected when a camera is presented in a way suggesting evaluation by others (as opposed to observation by an intimidating authority figure; see hypothesis 1). Thus, in addition to stimulating pro-social behavior, people intent on generating a positive image to the outside world would most likely show less undesired behavior as well. This leads to the following hypotheses:

Compared to a control situation without camera presence, camera surveillance instilling the impression that others are watching/evaluating one's behavior will lower incidences of cheating (2a) and increases pro-social behavior (2b).

The third line of reasoning in which cameras could influence behavior focuses on interpersonal processes. This approach questions whether the probability of detection or the possibility of evaluation by others is actually an essential ingredient for behavioral change to occur. That is, research by Bateson, Nettle and Roberts (2006) shows that a graphic representation of eyes suffices to prevent undesirable behavior. Specifically, when a picture of eyes was depicted in a university cafeteria (compared to a picture of flowers), a larger percentage of people paid for their drinks (i.e. donated money to an "honesty box"). What is most interesting about this study is that the image of eyes might have caused a sense of being watched, while no "real" others were involved, and thus no punishment or evaluation could be anticipated or foreseen.

Interestingly, Research by Govern and Marsch (2001) shows that not just the presence of a camera can make participants more self-aware, but that similar effects occur when participants are seated in front of a mirror (and hence, when there is no one watching but the participants themselves). Kallgren, Reno and Cialdini (2000) reproduced this effect by letting participants watch themselves on a monitor, and observed that those participants did indeed litter less (so they adhered better to social and/or personal norms) compared to participants who did not watch themselves on a monitor.

In other words, focus on the self-image by means of mirrors or monitors can result in a stronger focus on norms and values present in the individual self (Carver & Scheier 1978, Duval & Wicklund, 1972). Wicklund and Duval (1971) call this process self-evaluation, where people being observed reflect on their behavior and subject it to their personal norms and values, resulting in more normative behavior.

The present study will explore the possibility that watching oneself on a monitor makes participants more aware of their behavior and more focused on complying to existing or personal norms and values, even without the (suggested) presence of anyone who could evaluate behavior. This leads to the following hypotheses:

Compared to a control situation without monitor, watching oneself on a monitor should decrease cheating behavior (3a) and enhance pro-social behavior (3b).

This condition is distinct from the two other camera conditions in respect that participant get direct feedback from the image, instead of being confronted with a stationary surveillance camera. This makes this condition comparable to studies using mirrors, as well as to the other camera conditions we use in this study, since we did use a camera in our monitor setup.

Many previous studies on the influence of camera surveillance or monitors/mirrors on behavior do assume -rather than test- mediating processes, such as self-representational motives or self-awareness. One reason for this is that these psychological processes may not necessarily take place on a conscious level and are therefore difficult to capture with an explicit questionnaire (e.g., priming; Cameron, Brown-Lannuzzi & Payne, 2013). Therefore, researchers have argued that psychological mechanisms might best be uncovered by examining the impact of meaningful moderating variables, by measuring or manipulating them (i.e., variables which may either enhance or inhibit observed patterns. An example of this methodology can be seen in the study by Greenberg, Simon, Pyszczynski, Solomon & Chatel (1992)). In the current study we will follow this line of reasoning by including three personality traits that may interact with the manner in which the presence of a camera or monitor is presented.

First, it has been suggested that individuals with an external (rather than internal) Locus of Control are more sensitive to external / environmental cues in general, and the influence

of chance and powerful others in particular (Rotter, 1966). It thus seems feasible that the suggestion of authority influences people with an external LOC more strongly compared to people with an internal LOC.

Also, some people might be more sensitive to cues of being watched or being evaluated. Personality traits that might play a role with regard to this aspect are Need for Approval (NA) and Self-Monitoring (SM). People with high NA are more concerned about impression management, and will be more inclined to show 'good' behavior and avoid 'bad' behavior in front of others (cf. Van Rompay et al., 2009). Self-monitoring is conceptually close to NA. SM describes to which extent people are willing to adapt their behavior in order to get the approval of others (Gangestad, 1986). So, participants who score high for NA or SM are expected to be more inclined to behave themselves properly in front of cameras.

Finally, and as discussed before, personal norms and values might be activated by means of self-evaluation (induced by seeing oneself), and some personality traits might play a role in the effect of cameras and self-focus on behavior. One of such traits we are interested in is social value orientation (SVO), because SVO indicates whether a person is more inclined to behave pro-socially or more egoistically (De Dreu & Van Lange, 1995; Messick & McClintock, 1968). If the presence of a camera or monitor activates personal norms, it is likely that the effect of SVO on actual behavior will be stronger in these conditions.

Method

Experimental design and conditions

As stated in the introduction, we have three lines of reasoning in which behavior could be influenced by the way a camera or a monitor is presented in the environment. We wanted to put these lines of reasoning to the test in a single experiment so we would be able to evaluate each method in the same context.

Our experiment consisted of three conditions with a camera present, which were each compared to a control condition without any camera or monitor present ('no camera present'). The first condition involved a surveillance camera, presented in a way that makes it clear that an authority is watching who is able to punish ('authority watching'). The second condition incorporated a surveillance camera which was presented in a way which suggests one's behavior is being evaluated by others ('evaluation by others'). In the third condition people were not being watched at all, but were merely watching themselves on a monitor ('self-observation').

In the three conditions where a camera was present, each participant received a form they needed to sign which outlined the purpose of the camera in the room. This form informed the participant about the presence of the camera, the fact that the experimenter could

not access any recorded material, and the advice that they should act natural despite the camera presence. With signing, they would give permission that other departments of the university could use the material. In reality, the only video material recorded was by a hidden camera, and all of it was only accessible by the experimenters.

One paragraph on the form differed per condition; this was an important part of our manipulation. In the condition 'authority watching', the following text was included: "These recordings will be viewed by an independent party to make sure there are no disturbances or punishable behavior occurring during the study." For 'evaluation by others', the following text was included: "These recordings will be used in an unrelated study in which different types of nonverbal behavior will be encrypted. The behavior will be recorded throughout the study." For the condition 'self-observation', the following text was included: "These recordings are used to register the eye movements of the participant. The recordings will be digitally encoded in real-time by a computer; the original video stream will not be saved."

The participants were asked to solve nine puzzles. They were told that for every correctly solved puzzle they would earn money. Participants were told the reason for the experiment was to test whether people would solve more puzzles and be more positive about the task when a monetary reward was offered for solving each puzzle. During the experiment there was the possibility to cheat, which could be monitored by means of a hidden camera. At the start of the task they received a plastic cup with a preferred drink. During the task the experimenter "accidentally" dropped a can with pens. We measured pro-social behavior by observing three types of behavior: throwing away their empty plastic cup, helping the researcher collect pens that have fallen to the ground, and donating (some of) the money earned to a good cause after the experiment ended.

Participants

A total of 86 Bachelor students of psychology and communication studies at the University of Twente in the Netherlands participated in our research for credits or a small fee. These participants varied in age from 18 to 30 years (mean age = 21.56, Standard Deviation [SD] = 2.29). The sample consisted of 30 men and 56 women. Participants were randomly assigned to the experimental conditions.

Procedure

Respondents participated individually in the experiment; one participant at a time. The participant was welcomed in the room, which was decorated as an office, with two desks, a plant, and a bookcase with books and binders. Shortly after arriving, the participant was asked to sign an informed consent form, and they were offered something to drink. After the experimenter returned with the drink in a disposable cup, the participant received another form (which was an important part of the manipulation, disguised as an additional type of informed consent form), informing them about the presence and purpose of the

camera or monitor in the room (note that in the no-camera condition, this briefing did not occur). They were asked to read this meticulously, and sign the form when they were finished reading. The experimenter was present during reading, and checked afterward whether the participant had understood the information correctly.

After signing of the form, the experimenter gave the participant instructions for the main task, the puzzle task. For this task, participants had to figure out whether or not a matrix (containing 24 numbers in total) contained two numbers that added up to exactly ten. If they found these two numbers, the matrix had a solution which they could indicate by writing a big “+” with a marker on the answering form. If the matrix did not have a correct solution, they could write a “-” on the answering form (see figure 3.1). This test is based on a task designed by Mead et al. (2009), slightly adapted for this study (we included 24 instead of 12 numbers to increase the difficulty/time to solve the puzzles). Participants first read the instructions which were also explained by the experimenter, and then received a paper with nine matrices. As soon as they were handed the puzzles, a timer started counting down from ten minutes, and the experimenter left the room. Before the experimenter left, she explained she had to do something and wouldn’t be back before 15 minutes had passed, so she asked if the participant would stop working on the puzzles as soon as the alarm on the timer rang. The participant was instructed to get the form with the correct answers from the second desk in the room after the ten minutes had passed, and check the correct answers against their own answers, so they could report back the number of correct answers to the experimenter as soon as she got back.

Figure 3.1. Left: solvable puzzle, Right: unsolvable puzzle

During this task, participants had the option to cheat in multiple ways: they could work longer than 10 minutes on the puzzles, they could correct their answers afterwards with the answers on the answering form, or they could copy additional answers from the answering form. Additionally, they could guess after time was up (filling in random solutions to the puzzles without checking).

After the experimenter returned, the participant was asked to give the complete solution form to the experimenter, and subsequently received another questionnaire (distraction and manipulation check). While the experimenter handed over this form, she 'accidentally' knocked over a cup with pens, pencils and other office supplies on the desk, and observed whether or not the participant helped her collecting all the pens from the floor. After the participant got another moment alone to fill out these forms, the experimenter returned to debrief and pay the participant (in 50 cent coins), and give the participant an opportunity to donate a part of their earnings to the World Wildlife Fund (WWF). The experimenter had a donation box to this end, which she showed to the participant while making clear that any donation was completely voluntary and that it was a campaign of the WWF in which multiple researchers participated.

Twenty-four hours after the completion of the experiment, the participants received an email with a link to an online survey. They were told this questionnaire was unrelated to any previous participation in a study and it was included only to ensure the participants could actually earn a full credit for a whole hour of participation in experiments.

Ethics Statement

Prior to conducting this research this study was submitted to the Ethical Review Board of the University of Twente, department of Behavioral Sciences and has been approved. During the experiment, the participants were instructed and asked to sign a written consent form, which they all did. After signing they had the opportunity to ask questions. All participants were anonymized during the study and in the data files. After the experimental part the participant was briefly debriefed. After the study concluded all participants were sent an email with a detailed explanation of the study.

Manipulation checks

We included the following question in the last questionnaire during the experiment to check whether or not the participant understood the condition they were in: I was told that the camera is present in the room in order to: a) prevent illegal and irregular behavior, b) code my non-verbal behavior for an unrelated study, or c) code my eye-movements digitally. The 2 participants who answered this question inconsistent with the assigned condition were excluded from further analyses.

Measures

Behavioral outcome measures

The main dependent variables were different kinds of cheating and pro-social behavior, explained below.

Cheating

Participants could cheat in four different ways: they could copy answers from the answering form to the puzzles they didn't yet work on, they could correct their answers

with the answers from the answering form, they could continue after time was up, or they could guess the answers to the puzzles they didn't yet work on after time was up. Although, nobody directly copied the answers from the answering form to puzzles they didn't work on, we observed several instances of the other types of cheating and guessing behaviors. Guessing happened most often, even though the instructions did clearly state the participants should try to solve each puzzle before writing down an answer and stop as soon as the time was up. Per participant, and for each of the three categories we first estimated whether it occurred or not (yes/no). Next, we established per participant whether they cheated (correct answers and/or continue after time was up) or guessed at the deadline.

Pro-social behavior

We measured three different kinds of pro-social behavior: whether they threw away their trash at the end of the experiment, whether or not participants helped the experimenter collect fallen pens, and whether they donated money (and how much) to a good cause. Throwing away trash and helping were both recorded as dichotomous variables. Donating money was recorded as a percentage of the participant's earning during the experiment, ranking from 0 to 100%.

Personality traits as moderators

Twenty-four hours after participating in the experiment the participants received an e-mail with a link to a personality questionnaire (presented as part of another study). This questionnaire consisted of demographical questions and the following personality constructs: Locus of Control, Need for Approval, Self-monitoring and Social Value Orientation. Each one will be explained in detail below.

Locus of Control

To measure locus of control we used a Dutch translation of the 'Rotter Internal-External Control scale' (Rotter IE scale; Rotter, 1966). The Rotter IE scale consists of 23 items, each of which gives the participant the choice between two options; for example: a) "When I make plans, I am almost certain that I can make them work" (internal LOC, score '0') and b) "It is not always wise to plan too far ahead because many things turn out to be a matter of good or bad fortune anyhow" (external LOC, score '1'). All answers are then counted, resulting in individual scores ranging on a scale between 0 (internal control) to 23 (external control).

Need for Approval

To measure Need for Approval we used a Dutch translation of the Need for Approval scale developed by Straham and Gerbasi (1972; see also Van Rompay et al., 2009). This scale consists of 20 items. An example of a question is: "I will always try to stay polite, even to people I don't like". The items were measured on a scale ranging from 1 ('not at all agree') to 6 ('very much agree') ($\alpha = 0.66$).

Self-monitoring

To measure Self-monitoring we used a Dutch translation of the Self-monitoring scale developed by Snyder and Gangestad (1986). This scale consists of 18 items. An example of a question is: "I can only defend the ideas I believe in". The items were measured on a scale ranging from 1 ('not at all agree') to 7 ('very much agree') ($\alpha = 0.78$).

Social Value Orientation

To measure Social Value Orientation we used a decomposed game measure (Kuhlman & Marshello, 1975; Messick & McClintock, 1968). This measure can be used to classify individuals in a group of prosocially versus egoistically oriented people. It consists of a series of nine choices between distributions of outcome points, which were said to have value to both oneself as well as (hypothetical) another person. Participants were given a choice among three alternatives, each corresponding with a tendency to maximize joint outcomes (i.e. prosocials) or a tendency to maximize own outcomes either in an absolute sense (i.e. individualists) or relative to others' outcomes (i.e. competitors; De Dreu & McCusker, 1997; Van Lange, Otten, De Bruin, & Joireman, 1997).

An example of a task is: "I give: a) myself 400 points, the other 400 points, b) myself 500 points, the other 300 points, c) myself 420 points, the other 380 points." Based on this task, the participants were categorized in pro-social versus pro-self (either individualistic or competitive), because research shows that people with individualistic and competitive orientations show very similar behavioral patterns (e.g., De Dreu & Van Lange, 1995; see also Giebels, De Dreu & Van de Vliert, 2003). Five participants out of 86 could not be assigned a dominant orientation based on six or more answers in one category.

Analysis

To test the main effects of the camera-conditions and monitor-condition on cheating, we used Fisher's Exact Test, which is a variant of the Chi Square Test specifically suited for low N and frequencies of less than five per cell (Field, 2009). The Fisher's Exact Test works well with small sample sizes, and it is known to be rather conservative (actual rejection rate of H_0 is lower than α). We also used the Fisher's Exact Test and a Kruskal-Wallis test (a non-parametric ANOVA) to test the main effects of the camera-conditions and monitor-condition on pro-social behavior.

As an exploratory part of this study we wanted to test whether several personality traits interacted with camera condition. However, because of the small incidence of cheating in the present study, interactions are difficult to determine. Therefore, we used classification trees. Classification trees are especially suitable for exploratory data analysis. This method is mainly known for its use in data mining, but has shown its usefulness in many fields; including clinical data (Su, Azuero, Cho, Kvale, Meneses and McNees, 2011), test performance data (Gao and Rogers, 2011) and ecological data (De'ath and Fabricius, 2000). While mostly being used with large datasets, this non-parametric method is also

very well suited to analyze small datasets, especially where other methods fail because of low frequency categories (e.g., see Hayes, Usami, Jacobucci, & McArdle, 2015). Decision trees divide samples into meaningful sub-groups using ‘yes’ or ‘no’ questions, and present this data in an easy-to-read visual format. Theoretically, classification could continue until the end-nodes consist of only one case, but usually the division of the nodes is stopped when the improvement of the model doesn’t increase by a reasonable amount by asking further questions (Kingsford & Salzberg, 2008). Classification trees can be used to identify variables influencing the dependent variable and possible interactions between variables, and sort them by relevance. This information can subsequently be used in further research, in which such indications of possible interaction effects are used to formulate interaction hypotheses and to test for them specifically.

Results

For the purpose of clarity, we first discuss the results and hypotheses concerning cheating behavior, followed by pro-social behavior.

Cheating behavior: overview

In total, 10 of the 86 participants cheated, and 12 guessed answers after the time they were allowed to work on the puzzles was up. Table S1 in the supplementary materials (Appendix 2) illustrates how these numbers are distributed amongst the conditions, and gives an overview of all different types of cheating. The data we used in our analyses were ‘cheating overall’, and ‘guessing’. Table 3.1 below only shows the values used in our analyses.

Table 3.1. Number of participants who cheated / guessed in the different conditions.

	No camera present (N=21)	Authority watching (N=20)	Evaluation by others (N=22)	Self-observation (N=23)
Cheating overall	7	0	3	0
Guessing after time up	5	1	4	2

Although there seems to be a reasonable difference between conditions in number of participants who had guessed, a Fishers Exact Test does not yield any significant results upon testing ($n=86$, $p=.29$). We will therefore focus our analyses on the cheating overall variable.

Cheating behavior: testing our hypotheses

First we checked whether there was an overall significant effect of our manipulation on cheating behavior, using ‘cheating overall’ as the dependent variable. We used a Fisher’s Exact Test (the Freeman-Halton extension of the Fisher exact for a 2x4 contingency table), which yielded a significant difference of the manipulation ($n=86$, $p=.001$). Pairwise testing

shows that this could be explained by the difference between the conditions 'authority watching' & 'no camera present' and the difference between 'authority watching' & 'self-observation', as explained in the next sections.

To test our hypothesis 1a we checked whether a camera presented in an authoritative manner would discourage cheating behavior. We compared the 'authority watching' condition with the 'no camera present' condition. The dependent variable we used was 'cheating overall', so both types of cheating behavior taken together. We used a Fisher's Exact Test, which yielded a significant difference between 'authority watching' & 'no camera present' (Fisher's Exact Test, $p = .009$). Participants cheated significantly less often in the 'authority watching' condition compared to the 'no camera present' condition, thus confirming our hypothesis 1a (see table 1 for the exact numbers per condition). According to our results we can draw the conclusion that a camera presented in a way which suggests a watchful authority is keeping watch will discourage cheating behavior.

Hypothesis 2a states that a camera presented in a way suggesting the participant is being evaluated by a public / unknown person has a discouraging effect on cheating behavior. To test this we compared the 'evaluation by others' condition with the 'no camera present' condition. The dependent variable we used was 'cheating overall'. A Fisher's Exact Test showed no significant differences between these conditions present' (Fisher's Exact Test, $p = .162$, odds ratio: 3.17). Since there was no significant difference in the amount of cheating between the 'evaluation by others' condition compared to the condition without any cameras present, we could not confirm our hypothesis 2a. According to these results, a camera presented in a way which suggests to the subject he/she is being evaluated by others, does not discourage cheating. Interestingly, it should be noted that in this condition, all the observed cheating incidences concern the type where participants correct the answers from a sheet.

For hypothesis 3a we suggested a monitor would cause people to reflect upon their own behavior and thus behave better, so we expect to observe less cheating behavior when a monitor is present. To test this, we compared the 'self-observation' condition with the 'no camera present' condition. Again, the dependent variable we used was 'cheating overall'. A Fisher's Exact Test showed a significant effect between 'self-observation' & 'no camera present' (Fisher's Exact Test, $p = .003$). Participants cheated significantly less often in the 'self-observation' condition compared to the 'no camera present' condition, which confirms our hypothesis 3a. Therefore we can conclude that when participants can watch themselves on a monitor, they will display significantly less cheating behavior.

Pro-social behavior: overview

Participants could engage in different kinds of pro-social behavior during the experiment: they could clean up their trash after the experiment ended, they could help the experimented to collect pens after she knocked over a container full of pens, and they could donate a part of their earnings during the experiment to a good cause. Table 3.2 illustrates how

these numbers are distributed amongst the conditions. At first glance, and in accordance with our expectations, cleaning trash was lowest in the authority watching condition, while all participants helped with the fallen pens in the evaluation by others condition. Furthermore, the willingness to donate to a good cause was lowest in the no camera condition when there was no watching at all. However, these variations are not significant.

Table 3.2. Number of participants who did and did not help & threw away their trash in the different conditions, and the mean of the donation percentage per condition (percentage of earned money).

	No camera present	Authority watching	Evaluation by others	Self-observation
Cleaning trash (yes/no)	6/11	3/10	6/11	6/10
Help with pens (yes/no)	7/12	8/12	11/11	8/13
Donation (mean/SD)	44%/43	56%/44	51%/37	54%/42

Note: The differences in total N are due to some participants who did not have a drink (they could not leave a cup/tea bag as trash), or the dropping of the pens by the experimenter not working out as it should (e.g., the pens didn't drop at all)

Pro-social behavior: testing our hypotheses

First we checked whether there was an overall significant effect of our manipulation on pro-social behavior. The dependent variables we used were 'cleaning trash', 'help with pens' and 'donation'. For 'Cleaning Trash' we used a Fisher's Exact Test (Freeman-Halton extension), which did not yield a significant result. For 'help with pens' we used a Fisher's Exact Test (Freeman-Halton extension), which did not yield a significant result either. For 'donation' we first performed a normality test. A Shapiro-Wilk test showed the data had a non-normal distribution, so instead of a regular univariate analysis (ANOVA), we proceeded to use a Kruskal-Wallis test. This test showed no significant effect of condition overall ($p = .801$). Therefore, we did not proceed with pairwise comparisons.

Hypothesis 1b states we expect a camera presented in an intimidating manner will discourage pro-social behavior. To test this hypothesis we compared the 'authority watching' condition with the 'no camera present' condition. The dependent variables we used were 'cleaning trash', 'help with pens' and 'donation'; the three different kinds of pro-social behavior we measured. For 'cleaning trash' we used a Fisher's Exact Test, which showed no significant differences between these conditions (Fisher's Exact Test, $p = .691$, odds ratio: 0.55). For 'help with pens' we also used a Fisher's Exact Test, which again showed no significant differences between these conditions (Fisher's Exact Test, $p = 1$, odds ratio: 0.88). For 'donation' we used a Kruskal-Wallis test, which also showed no significant differences between these conditions. Due to no significant differences in the amount of observed pro-social behavior between the condition 'authority watching' condition compared to the 'no camera present' condition, we could not confirm our hypothesis 1b. According to these results, a camera presented in a way to suggest an authority is keeping watch does not discourage (nor encourage) pro-social behavior.

For hypothesis 2b we expect the presence of a camera presented in a way suggesting the participant is being evaluated by a public / unknown person will encourage pro-social behavior. To test this we compared the 'evaluation by others' condition with the 'no camera present' condition. Again, the dependent variables we used were 'cleaning trash' (Fisher's Exact Test, $p = 1$, odds ratio: 1), 'help with pens' (Fisher's Exact Test, $p = .531$, odds ratio: 0.58) and 'donation'. We did not find significant differences between the conditions for any of the dependent variables, therefore we could not confirm hypothesis 2b. There was no significant difference in the amount of pro-social behavior between the 'evaluation by others' condition compared to the condition without any cameras present. Therefore we can conclude that a camera presented in such a way to suggest the participant is being evaluated by others, will not encourage (nor discourage) pro-social behavior.

Hypothesis 3b suggests a monitor would cause people to reflect upon their own behavior and thus behave more according to (their) norms and values, so we expect to observe more pro-social behavior when a monitor is present. To test this we compared the 'self-observation' condition with the 'no camera present' condition. The dependent variables we used were 'cleaning trash' (Fisher's Exact Test, $p = 1$, odds ratio: 0.9), 'help with pens' (Fisher's Exact Test, $p = 1$, odds ratio: 0.95) and 'donation'. We did not find significant differences between the conditions for any of the dependent variables. Participants did not show any more pro-social behavior in the 'self-observation' condition compared to the 'no camera present' condition, therefore we could not confirm hypothesis 3b. According to these results we can conclude that when participants can watch themselves on a monitor, they will not show more pro-social behavior.

Classification trees: testing the moderators

A classification tree built with dependent variable 'cheating overall' and as independent variables the personality traits LOC, NA, SM & SVO shows that for all conditions -except the 'no camera' condition-, the condition the participant is placed in is the most important factor to predict if people cheat or not. 'Authority watching' and 'self-observation' are shown to be more effective than 'neutral camera'. 'Authority watching' and 'self-observation' seem to be comparable in effectiveness. For the condition without camera, the tree shows that LOC score is an important measure to predict whether people cheat, with a cut-off point on (12.5), which lies in the 'external LOC' area (defined as 11 and higher), indicating that people with an internal Locus of Control (LOC score ≤ 12.5) are more inclined to cheat when there is no camera around, compared to people with an external locus of control (see Appendix 1).

The best fitting classification trees for the pro-social behavioral measures cleaning trash and helping did not show any interactions between personality measures and the experimental conditions.

Discussion

The purpose of this study was to examine whether displays of undesired behavior (cheating) and pro-social behavior (cleaning up trash, helping behavior & donating money to a good cause) are affected by the way indoor surveillance-methods are presented (i.e., framed). In most experiments, a situation with a camera present is pitted against a 'no camera present' condition, however, different variations in framing of camera presence have to our knowledge never been tested in a single setup. We explored three different perspectives: the first approach is derived from criminology where we present the camera in a manner suggesting an authority who can punish is watching, an approach assuming undesired behavior is a rational process of cost-benefit analysis. The other two approaches stem from psychology; one assumes people try to represent themselves better in the real or suggested presence of others, the other approach assumes people will act in accordance with internally present norms and values when they are confronted by an image of themselves. We wanted to test these different methods of presenting surveillance in a single controlled experimental setting, in order to demonstrate that the 'framing' of camera surveillance indeed makes a difference.

Our results support the popular notion that camera presence decreases undesired behavior, in this case: cheating. Our study also supports the idea that the framing of a camera's presence does indeed influence cheating behavior in different ways. The presence of a camera presented in a non-intimidating, non-authoritative manner managed to reduce cheating behavior slightly, but not significantly. However, cheating behavior decreased significantly when the camera was presented in an intimidating, authoritative manner. This supports the statement by Levine (2000) that the impression about the person who is watching through the camera is important for effects of camera surveillance to crystalize.

We found that a camera presented in an authoritative manner and a monitor facilitating self-observation are both significantly effective in the prevention of cheating behavior. Apparently not only the chance of being caught by an authority can be a great motivator to discourage cheating, but observing one's own image "does the trick" just as well. This is notable, because very different psychological processes are assumed to be responsible for these two pathways. In other words, both rational considerations may be involved (i.e., when an authority is watching, who can punish in case of misbehavior; cf. Levine, 2000), but also more implicit self-confrontational processes, enhancing a sense of a 'just' self.

This study focuses on an indoor setting, where participants complete a typical task for this type of setting. In outdoor environments, a wider variety of environmental factors could play a role. For instance, people can more easily overlook the camera and its framing in an outdoor environment, whereas camera presence and accompanying messages could not be overlooked in our research. Hence, it would be worthwhile to test whether framing effects (such as those revealed in the current research) uphold in outdoor settings.

Looking at the type of cheating, we see that the type of cheating which is most affected by camera presence is 'continuing after time runs out'. We categorized this as being the 'less serious' type of cheating (as is evident from the frequency of occurrence in the 'no camera' condition), but on the other hand, this is the type of cheating that is most easily caught on camera (i.e., more so than subtly correcting an answer upon checking the answers from the correction sheet behind the barrier on the desk). As we can see in the frequency table (table 1), 'continuing after time is up' did not occur with any type of camera present, while correcting did happen a few times when the camera was being neutrally presented in a non-intimidating manner. This might indicate that (in a camera's presence) detectability of undesired behavior is a more important factor than the seriousness of behavior, a finding which also points at rational processes playing an important role.

We did not find a significant effect of the presence of a camera or monitor on the occurrence of guessing. We measured the amount of guessing because we instructed participants to solve the puzzles, and guessing the answer could be considered as (mildly) transgressive behavior. However, guessing was not explicitly forbidden, and since guessing is a technique often used by students to answer multiple-choice questions, it will probably not be seen as deviant or undesired behavior during an experiment. This might explain why camera presence and framing did not affect this type of behavior.

While looking at pro-social behavior we did not find any significant results even though we did expect that the authoritatively presented security camera would discourage pro-social behavior. This might be attributed to the experimental setting in an university office building. The study by Van Bommel et al. (2014) suggested that the adverse effect of camera surveillance on helping behavior only occurred when no bystanders were present. Therefore, this adverse effect is more feasible to occur in an empty street setting compared to an indoor office setting, since an office setting most likely has bystanders present nearby. While we did have no bystanders present during our experiment, the possible presence of people nearby might have negated the effect. Additionally, the helping behavior we used in our experiment was very different from the type of helping behavior used in the study by Van Bommel et al. (2014).

When a camera was presented in a neutral, friendly manner we expected to see more pro-social behavior, in line with Rompay et al. (2009) who showed that people are more willing to help in an indoor setting when a camera is present. However, in the latter study the 'accident' where the participant could help out the experimenter occurred at the beginning of the experiment, whereas in our study it took place near the end of the session. Arguably, at the beginning of an experiment, participants might be trying to make a good impression by representing his/herself well, and additionally might have been more sensitive to the new environment and the presence of the camera in particular.

We also expected to see more pro-social behavior when a monitor was present, because we expected the monitor to make people more focused on themselves and evaluate their

own behavior, and thus behave more 'correctly'. However, the presence of a monitor only seems effective in preventing undesirable behavior, while it does not seem to stimulate pro-social behavior. Previous research (Gibbons & Wicklund, 1982) indicates that situational factors (like the salience of the helping norm and the focus of attention) are highly relevant in predicting whether or not helping behavior is stimulated or impeded by self-focus via various means (e.g., by a mirror or listening to one's own recorded voice).

Explorative analysis of our data using regression trees hinted at potentially interesting interactions between camera presence and framing on the one hand, and personality traits on the other. Admittedly, this part of our study is explorative, designed to reveal possible personality-environment interactions influencing cheating behavior in our data, which should be further examined in larger-scale follow-up studies. The aim of this analysis was to bring some insight in how the different variables we measured and manipulated relate to each other and to cheating. Personality traits did not seem to interact with the conditions where a camera or monitor was actually present; those effects were best explained by the main effects already described. However, when there was no camera present (the 'no camera condition'), the personality measure 'Locus of Control' did seem to play a role in whether or not participants would cheat during the experiment. Specifically, participants with a more internal LOC were more inclined to cheat when there was no camera present. As people with an internal LOC can generally be seen as people who believe that the outcome of events result primarily from their own doing, this may explain why they will also seize the opportunity to earn more money on an experiment by cheating when they believe nobody is watching them.

The personality traits Need for Approval (NA) and Self-Monitoring (SM) did not seem to moderate the effect of camera surveillance on behavior. These traits are similar; both relate to leaving a good impression on others. We did not find an effect of these traits on the behavior of the participants being watched with a camera or watching themselves via a monitor, therefore these traits do not seem to be relevant in changing behavior in the conditions of our experiment. The last personality trait we explored is social value orientation (SVO), which regards a person's affinity to behave more pro-social or more pro-self. We theorized this trait might have been amplified by triggering self-evaluation, but this does not seem to be the case.

Concluding, this study shows that the way camera surveillance is presented is a primary factor to reckon with when employing camera surveillance as a means to guide behavior and prevent transgressions. Taking this into account might enable policy makers to increase the effectiveness of indoor camera surveillance in a low-cost manner (e.g., via visual communications, explicit verbal statements (i.e. audio messages)). Additionally, this finding also sheds light on the fact why previous meta-analyses of camera surveillance often show contradictory results; context is all-important.

Furthermore, this study revealed that making people more focused on themselves by means of a monitor works equally well compared to the most effective camera condition. This could be taken to suggest that even without cameras or monitors, people can still be discouraged to show undesired behavior by very subtle means that lead people to reflect on what is just and correct. In addition to confronting people with their own image, future studies could explore to what extent watchful eyes presented on, for instance, posters in lobbies, entrances or waiting areas of indoor settings could help create the right mindset so that transgressions on subsequent tasks (e.g., filling out forms at the town center) might be counteracted. Awaiting future research exploring these and related issues, we feel confident that current undertaking opens up avenues for further integrating the fields of criminology and the behavioral sciences so as to make the best of situational crime prevention in the years to come.

Chapter 4

I'll be watching you

Effects of watching eyes and authority cues on littering behavior

In this chapter we tried to take the findings of the previous chapter into a real-world setting; a bike parking at the campus of the University of Twente. We distributed flyers which could be littered, and placed these flyers on bikes. The aim of this study was to test whether or not the effects of being watched could be achieved in the field without the use of a camera. To this end, we used images of eyes, and tested the effect of these images on littering behavior. We framed these images in different ways similar to the cameras in the previous chapter, to see whether the suggestion of authority would have a stronger effect compared to a neutral suggestion of being watched.

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Littering is a problem in many residential areas. Litter is unsightly, of negative influence on neighborhood perception (e.g., impressions of attractiveness and safety), and arguably harmful to the environment (Schultz, Bator, Large, Bruni & Tabanico, 2013). The annual costs of preventing, cleaning and processing litter in the Netherlands alone have been estimated to be approximately 250 million euro (Deloitte, 2010). Also, and in line with the Broken Windows Theory (Wilson & Kelling, 1982), an environment with visible litter is likely to increase a range of undesirable behaviors ranging from more littering (Cialdini, Reno & Kallgren, 1990) to vandalism and theft (Keizer, Lindenberg & Steg, 2008).

Previous research suggests that littering is influenced by many different factors, including individual characteristics as well as the social and physical environment (Robinson, 1975). In contrast to traditional approaches aimed at explicit persuasion (e.g., warnings or surveillance cameras), in recent years, researchers and practitioners increasingly turn to more implicit means for behavior change. For instance, at Schiphol airport, a picture of a fly inside urinals led to significant reductions in spillage (although this was not empirically researched; some claim up to 80%) and related cleaning costs.

In this exploratory field study, we will study the impact of an equally subtle prime: a pair of eyes depicted on flyers for an upcoming event, which were attached to bicycles. Would littering be less compared to a situation with 'eye-less' flowers? Furthermore, does it matter whether the eyes depicted are intense or neutral? Finally, we were interested in studying whether these effects vary depending on the presence of authority cues (i.e., police stripes). Before going into the details of this study, first we will elaborate on the key notions involved.

Environment and behavior change

There are different strategies aimed at environmentally-induced behavior change (a reduction of littering in the present study). An alternative to 'warning' or 'fear-based' approaches ("You will be prosecuted!") might consist of triggering people's 'own' norms and values. That is, as littering is generally considered anti-social and harmful to the environment, most individuals will have an anti-littering norm internalized (Cialdini et al., 1990). However, to behave accordingly, this norm needs to be activated. As an example, Kort, McCalley, and Midden (2008) showed that a mirror attached to a trashcan might be one way to confront people with their internalized norms.

Efforts to gain understanding of the impact of anti-littering measures on littering behavior have generally taken one of two approaches: a rational approach (in line with warning or fear-based approaches), or a more subconscious approach using subtle means such as small mirrors, as in De Kort et al. (2008). To be more specific, the former uses a direct, explicit approach, involving anti-littering signs, educational programs or campaigns, or anti-littering incentives (See Dwyer, Leeming, Cobern, Porter, & Jackson, 1993 for an overview). However, research indicates that this explicit ('conscious') strategy may not be

that effective to reduce littering (Dwyer et al, 1993). Recently, the focus has shifted to the latter approach, using more subtle, indirect methods such as implicit prompts or “nudges” to influence behaviour. These strategies typically try to prevent littering through intervening in the direct environment, for instance by using subtle objects or depictions (e.g., the fly in Schiphol’s urinals), or by inspiring the ‘feeling’ of being watched through mirrors or ‘watching eyes’. The effectiveness of these implicit measures on norm-conforming behaviour might be attributed to the activation of self-awareness (Govern & Marsch, 2001).

In line with this argument, multiple studies demonstrate that mirrors or monitors displaying the face of participants may reduce littering. For instance, a study by Kallgren, Reno and Cialdini (2000) demonstrated that participants littered less after being exposed to a live image of themselves on a monitor, and the aforementioned study by De Kort et al. (2008) showed that the addition of mirrors on trash cans reduced littering (i.e., disposal of flyers on the street). In addition to littering, these means have also been proven effective in other domains. For instance, Van Rompay, Vonk, and Fransen (2009) showed that the presence of a camera in an indoor setting stimulated helping behaviour of students (i.e., helping the experimenter to pick up a pile of papers she had ‘accidentally’ dropped on the ground). However, in the latter study it was not clear whether behavior change resulted from enhanced self-awareness (and coupled norm activation) or from the implied presence of a ‘watching’ authority figure.

The ‘Watchful Eye’ phenomenon

Interestingly, and of relevance here, a recent line of research focuses on effects of ‘watchful eyes’ in stimulating pro-social behavior. A property of both mirrors and eye images is that there is no presumed or actual observation taking place. Thus, there is no real threat of sanctions or punishment in case of a transgression. Still, the positive effects of ‘watchful eyes’ have been convincingly demonstrated in both lab and field experiments (e.g., Bateson, Nettle & Roberts, 2006). For instance, it has been shown that images of eyes stimulate prosocial behaviors like donating money in a supermarket (Powell, Roberts, & Nettle, 2012), and generosity in an economic game (Haley & Fessler, 2005). Furthermore, they have also been shown to prevent undesirable behaviors such as bike theft (Nettle, Nott & Bateson, 2012).

Generally, it is assumed that watchful eyes are effective because they trigger the feeling of being watched, and thus of being ‘under evaluation’ (Baillon, Selim & Dolder, 2013). But how realistic or life-like do these images have to be in order to induce such an effect? Izuma (2012) suggests that ‘eye-like’ stimuli might cause an automatic psychological reaction, but that this reaction can be induced by any kind of image resembling eyes. In several studies, different kinds of eye images have been used alongside each other. In some of those studies the results per specific eye image have been reported (see Bateson et al., 2006). Interestingly, the Bateson et al. (2006) study implied differences in eye effectiveness; images looking straight at the viewer with wide-open eyes appeared

to be more effective than images of quirky eyes looking sideways at the viewer. These differences could be explained by how intimidating the depicted eyes appear. Carbon and Hesslinger (2011) put this assumption to the test by asking respondents to rate the pictures used by Bateson et al (2006) on the variables 'observing' and 'frightening'. Interestingly, both variables seemed effective in inducing pro-social behaviour; more observing and/or frightening eyes resulted in higher amounts of money donated in an honesty box (Carbon & Hesslinger, 2011).

In the current study we are interested to see whether eye images can be effective in preventing littering in an outdoor field setting. We expect that -compared to a control image - images of eyes in the physical environment will make people litter less (Hypothesis 1a). For this purpose, we distributed flyers among bikes at a university campus. These flyers were adorned with eye images or control images and we were interested to see whether flyers with eyes would be less readily discarded and thrown on the street. Furthermore, we selected two different pairs of eyes; one 'neutral' pair, and one pair with wide open, intense looking eyes; the type that appeared most effective in the Bateson et al. (2006) study. Hence, we expect that an image of intense, wide open eyes will have a stronger effect on preventing littering, compared to an image of neutral eyes (Hypothesis 1b).

As suggested throughout, watchful eyes may be most effective when associated with authority. In line with this assumption, research by Levine (2000) showed that the effectiveness of camera surveillance varies with attributions of authority to the person watching: when perceived as an authority who can punish, camera effectiveness increased. In addition to eye features characterizing authoritarian eyes, perceptions of authority might also be enhanced by adding another visual element to the depiction of eyes. A recent study by Nettle, Nott and Bateson (2012), for instance, uses a poster displaying eye images combined with a police logo; a suggestion of authority which arguably renders the eyes more intimidating. This poster, combining eyes and logo, managed to reduce bike theft on campus (a more severe type of transgressive behaviour than investigated previously). However, eyes and logo were not manipulated independently, hence this study does not warrant conclusions as to their separate effects.

Therefore, in this study, using an experimental design, we test the effects of different eye types in conjunction with authority cues. In addition to expecting that eyes are more effective compared to a control condition (Hypothesis 1a), and that intense eyes are more effective compared to neutral eyes (Hypothesis 1b), we expect that the addition of an authority cue (i.e., police-car stripes on the flyer as opposed to a neutral pattern) will further enhance the effect(s) of watchful eyes, thus causing people to litter less (Hypothesis 2).

Next to testing effects of watchful eyes on littering, our field experiment also allowed us to explore the importance of situational factors which might influence littering. Next

to age category and gender (both have been shown to affect the prevalence of deviant behaviour; older people and females generally show less deviant behaviour. See Gove, 1985), we observed the behavior of the person confronted with the flyers. Specifically, we included activity and attentiveness measures by observing whether they were engaged in another activity at the same time, and how long they actually looked at the flyers. Furthermore, we included the crowdedness of the area (how many people were present at the target location?). This latter variable is important as occurrences of normative behaviors may result from other people observing the socially desirable (or undesirable) act, a notion also prevalent in Latané's (1981) Social Impact Theory, suggesting that social impact rises as audience size increases.

Method

Participants and general setup

This field study was conducted at the campus of the University of Twente in The Netherlands. A total of 944 persons were observed for this study. They were anonymous people who put their bike in the area we designated as our research area. In this area flyers are regularly attached to bikes for promotional purposes (e.g., student events). In this study, the flyers represented advertisements for a movie showing, but were in fact our experimental prompts. As trashcans were not available within the experimental area, we could observe our respondents' ensuing behaviors. Specifically, what do they do with the flyers attached to their bikes? The fact that trashcans were unavailable in the immediate environment presupposes an effort of the participants in so far he or she will have to hold on to the flyer until an opportunity for disposal (i.e., a trash can) presents itself. This situation and the subsequent dilemma appropriately represent the natural circumstances people are often confronted with in their daily life.

The great majority of the people we observed were students, attending lectures in the building or buildings nearby. We estimated the majority (98%) of our respondents to be within the '18-40 years' age range. Since there was little variation in age, and age estimation was rather imprecise, we decided not to use this variable in our analyses. In total, 565 of our participants (60 %) were male.

Experimental design

For our study we used a 3 (wide open eyes/neutral eyes/flowers) by 2 (police markings vs neutral stripes) factorial design. See Table 4.1 for a distribution of the participants over the 6 experimental conditions.

Table 4.1: Distribution of participants among the conditions

	Intense eyes	Neutral eyes	Flowers (control)	Total
Police markings	157	156	155	468
Neutral stripes	159	158	159	476
Total	316	314	314	944

To select eye images, we conducted a pre-test with a focus group, using 13 eye images of which we finally selected the image which was considered most ‘neutral’, and the one which was perceived as most ‘intense’.

We printed flyers and posters using the intense eyes, the neutral eyes or the flower images. We combined these images with neutral, colored horizontal stripes or with a pattern and color scheme resembling the pattern on a regular Dutch police car. All conditions use the same colors. To enhance realism of the flyer, we used a text advertising for a non-existent student movie production. See figure 4.1 for an overview of all conditions.

Figure 4.1. An overview of the six stimuli

Materials

To make the images of eyes clearly visible, the flyers consisted of two layers: a printed layer on the front, and a plain white back layer, stapled together. The flyers were attached to the bikes on the handles of the handlebar, with a staple above and below the handle and the image facing up, clearly visible for anyone taking the bike. If there already was a flyer attached to the bike, we took it off first. We placed our flyer in such a way that it had to be torn prior to removal. Hence, participants had to exert effort to deal with the flyer (and the wind could not blow it away). Whenever possible, we placed the flyer next to a bell, handbrake or gear shift, to make it hard to move the flyer to the middle of the handlebar without tearing it.

In addition to the flyers, poster-boards were positioned in the environment (displaying the same enlarged flyer as the one attached to the bikes) in order to further enhance the salience of our manipulations.

Figure 4.2. The flyers attached to the bikes and one of the poster boards in the experimental area

Procedure

The observations took place on 12 weekdays distributed over October and November 2012. The observations were always conducted with two observers present. We ran each condition for a day (from about 12.30 until about 16.30, during daylight), distributed randomly over the days of the week. We ran each condition twice (so we ended up with about 150 or more observations per condition), but took care that we did not run the same condition on the same day of the week. Furthermore, we did not run our experiment during days with bad or rainy weather, nor during vacation periods and exam weeks.

At the beginning of the day (at around 11:00 AM), we distributed flyers among all the bikes present in the area, and placed five poster boards in and around the experimental area (see figure 2 for placement). Obviously, every flyer and poster in the same data collection session would display the same condition. We also dispersed some flyers on the ground in our target area, so that there would be signs of littering at all times (as a fully clean and

orderly environment might prevent people from being 'the first to litter'; Cialdini, Reno & Kallgren, 1990). These scattered flyers were flyers of the same current condition; all other flyers and litter were removed beforehand.

Halfway the day (at about 14.15 hrs) we distributed new flyers on the recently parked bikes, and cleaned some of the flyers thrown on the ground in the area (in order to maintain a constant level of flyers scattered on the ground). Thus, we took great care to let the research area appear neither too littered nor too clean. The poster boards were placed inside the research area at the intersections and at the two entrances of the parking area.

The experimental area was observed from the 4th floor of the building adjacent to the bike parking area. All observations were conducted with two observers present. In a pre-experiment training session, 100 % inter-rater agreement was established for all scoring categories, the reason why observations were split between the observers, allowing us to monitor basically all potential participants.

The experiment was stopped for the day as soon as we reached 75-80 participants. If we could not reach that number of observations, we stopped the experiment as soon as it got dark and ran the condition for an extra day. At the end of each day, we removed the remaining flyers on the bikes which were still parked in the experimental area. We also removed the poster boards and removed all the littered flyers in and around the area.

Environment

The area we used for our study is a bike parking area situated behind a building at the campus of the University of Twente, which at the time of our experiment housed the departments of psychology and mathematics, and several lecture halls (see figure 4.3 for an overview of the area).

Figure 4.3. A schematic overview of the experimental area, and a picture of the situation

Measurements

Behavioral outcome measures

For this study, we focused on two categories of behavior:

- **Littering within the experimental area.**
- **Taking the flyer along.** In these cases, people put the flyer in their pocket, their bag, into the bags attached to their bicycle, etc.

These behaviors (reflecting the two choices people have upon confrontation with the flyer) served as our main outcome measures. Additionally, however, the following behavioral acts occurred regularly during the pilot test and the experiment:

- **Leaving the flyer on the handlebar.** In these cases, people did not take the flyer of their bike, but rather folded it, adjusted it, or moved it aside so they could use their bike handles.
- **Putting the flyer on another bike, or another object in the experimental area.** In these cases, people took the flyer and actively searched for a spot to displace the flyer (the bike stand, a staircase or sometimes even the poster boards we used in the area), instead of taking it with them or throwing it on the ground.

Other measures

Next to **gender** and **age category** we also established:

- **Activity of the participant.** We noted what the participants was doing while walking to their bicycle. The most frequent categories were mobile phone use (including calling, texting or listening to music) and interacting with one or more accompanying persons (e.g., talking, laughing, listening). In the end, we decided to split this variable in two categories: People doing nothing besides walking to their bike (748 participants), and people who were busy doing something else while walking (186 participants).
- **Attention to the flyer.** We noted whether the participants glanced at the flyer for a short time (<2 seconds) or looked at it for a longer duration (>2 seconds). Of the 944 observations, 80 participants looked at the flyer for more than about 2 seconds.
- **Crowdedness of the research area.** We noted how crowded the area was at the moment when we observed our participant. Most of the time the area was not crowded at all, on only one occasion we counted more than 10 persons. Hence, we did not use this variable in our analyses.

Results

First, we present an overview of all the behavioral data we collected during this experiment, presenting all four categories of interaction with the flyer (i.e., our main behavioral categories plus the two additional categories observed across the six experimental conditions; see Figure 4.1). Next, we will test the hypotheses outlined in the introduction. For this, we used only the two main littering behaviors: obvious littering (throwing the flyer on the floor) contrasted with obvious non-littering (the participant taking the flyer with them, outside of the experimental area). Subsequent to hypothesis testing, we will further analyze our data, exploring effects of the other variables we included in our observations.

Overview of all the recorded behavioral outcomes

The bar-charts in Figure 4.4 give an overview of all behavioral outcome variables associated with the six experimental conditions.

Figure 4.4. Overview of littering behavior per condition

As can be seen in Figure 4.4, all four interaction types occurred regularly and hence warrant attention. Overall, littering appears to be the most common behavior type (around 50% of all recorded behaviors). Thus, in approximately 50% of all cases littering occurred, paying testimony to the relevance and seriousness of the phenomenon under observation. In addition, two patterns stand out in the charts: ‘putting the flyer on another bike or another object in the experimental area’ occur most often in the conditions with police

markings and in both of the eye conditions, whereas 'leaving the flyer on the handlebar' occurs most often in the conditions with the intense eyes and the flower images.

Testing the hypotheses

For the hypotheses testing we used our main littering behaviors: obvious littering (throwing the flyer on the ground) and non-littering (the participant taking the flyer with them, outside of the experimental area) as dependent variables.

To test whether there was an effect of eye images in general on littering, a chi-square test was conducted, comparing all the eye image conditions with the flower image conditions. When comparing only the instances of littering versus non-littering, we found that 83% of the participants littered in the flower situation, compared to 75% in the eye images situation; a significant difference, $\chi^2(1, N = 598) = 4.97, p = .016$. This confirms our hypothesis 1a: Eye images seem to reduce littering, compared to images of flowers.

To test whether there was an effect of the type of eye image on littering, a chi-square test was conducted, comparing the two types of eye images, intense and neutral. Again, when comparing littering versus non-littering, we found that 77% of the participants littered in the intense eye-image situation, compared to 74% in the neutral eye-image situation, a *non-significant* difference, $\chi^2(1, N = 394) = .51, p = .276$. Hence, hypothesis 1b could not be confirmed; while eye images do reduce littering, the type of eye-image does not seem to be relevant.

To test whether there was an effect of police stripes on littering, a chi-square test was conducted, comparing the images with police stripes with the images with neutral stripes. This time, we found that 83% of the participants littered in the police stripes situation, compared to 74% in the neutral stripes situation; a significant difference, $\chi^2(1, N = 598) = 6.40, p = .007$. We suggested that police stripes might reduce littering, but the opposite seems to be true: police stripes stimulate littering. Hence, hypothesis 2 is rejected.

Visualization of the effect of the experimental conditions for littering vs not littering

To gain further insight into the data we used for the hypotheses testing, we explored it using classification trees. These tree diagrams are useful to construct a predictive model for the value of the dependent variable based on several independent variables (see Kingsford & Salzberg, 2008). In the case of a classification tree, the goal would be to create end nodes which are as homogenous as possible. A split is created based on information gain: using the variable depicted in the first split, the largest amount of information gain is achieved, i.e.: the biggest jump in homogeneity within the categories is conceived. Each subsequent split will further reduce the heterogeneity in the groups.

When we only consider our experimental conditions, the tree shows an interesting pattern: the neutral eyes seem to be more effective to prevent littering behavior in the condition

with neutral markings, and the intense eyes seem to be more effective in preventing littering in the condition with the police markings (Figure 4.5).

Additional analyses

When all other independent variables are considered (in Figure 4.6), we see that the participants who only glanced at the flyer briefly are most prone to littering. In this group, we see a gender effect in littering as well: The male participants litter more than the female participants. Going even deeper into the tree, we see that the behavior of female participants is more strongly influenced by the eyes, whereas male participants are more susceptible to the (neutral) flower images.

Specifically, for female participants, the conditions that seems to have the least effect preventing littering behavior (intense eyes & flowers) is being further influenced by the markings: police markings make them litter less. For males, the experimental condition is less important in influencing littering behavior than the activity they are engaged in when confronted with the flyer. When engaged in social activity (talking to a friend or talking on the phone) or doing something else (e.g., listening to music), they litter less than when they were not engaged in other activities. Furthermore, for male participants, littering behavior seems to be stimulated by seeing police stripes on the flyers. Going deeper into the tree for males, the effect of neutral-striped flyers appears to be further differentiated by type of eyes: neutral eyes on a flyer with neutral stripes seems to make them litter less. In conclusion, it seems that the experimental condition in which the least littering is observed, is for men the neutral eyes / neutral stripes condition, and for women the neutral eyes condition, regardless of markings. The experimental condition in which the most littering behavior is observed, is for men the police markings condition, regardless of eyes, and for women the flowers or intense eyes, combined with neutral stripes.

Thus, neutral eyes seem to be most effective in preventing littering, but whether or not police markings or neutral markings are more effective, depends per gender.

Discussion

Importantly, littering occurred frequently. Our study shows that regardless of the specific circumstances (i.e., our experimental conditions), around 50 % of observed participants littered. Equally important, this study clearly shows that littering is a very complex behavior type, implying different (psychological) processes and situational determinants. That is, on the outset, we expected to observe two kinds of littering behavior: littering (throwing the flyer on the ground) versus non-littering (which would be 'accepting' the flyer). However, we found that people have more ways of dealing with the flyer, most notably putting the flyer on another object, or ignoring the flyer completely.

Figure 4.5. Classification tree of littering behavior per experimental condition

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Figure 4.6. Classification tree of littering behavior with all independent variables plus experimental conditions

These latter two response categories occurred quite frequently, and while we did not include them in our hypothesis testing, for explorative purposes we included them in our overall analyses. To elaborate, we considered the behavior ‘leaving the flyer on the handlebar’ as ‘ignoring the flyer’, but it could also be interpreted as postponing the problem of dealing with the flyer. Whether the outcome of this ‘postponing’ is desirable (e.g., throwing the flyer in a trashcan somewhere else) cannot be answered based on our data. That is, either the intent is to leave the flyer there until a trashcan is observed (‘desirable’), or littering is postponed until later when no one is watching (‘undesirable’).

The behavior ‘putting the flyer on another bike or another object in the experimental area’ is interesting; it seems to be a rather undesirable type of behavior as responsibility is transferred to another person (i.e., diffused responsibility; Darley & Latané, 1968). In our study, participants seemed to go to great lengths in order to secure their flyer onto another object. Arguably, from their perspective, this course of action was more acceptable compared to littering, and at the same time it took away the necessity to deal with the flyer. From a practical perspective, however, this type of behavior might result in more littering in the end as irritation is likely to increase in the next round of person-flyer interaction (involving an additional flyer on one’s bike).

For our hypotheses, we tested whether our experimental conditions had effect on littering versus non-littering. As expected, eye images seemed to be more effective in preventing littering than images of flowers. However, contrary to the Bateson study (2006), we found no significant difference between the intense and neutral eyes. One reason for this might relate to the type of behavior; we measured littering, whereas they studied the amount of money payed for drinks in a university coffee room. Additionally, the message on the poster used in the Bateson study was directly related to the type of behavior they were trying to stimulate, perhaps ensuring a more direct connection between the eyes and the targeted behavior. In our study, there was no obvious connection between the flyers (in which the eyes were embedded) and littering.

Although the comparison between the intense eyes versus the neutral eyes was not significant, the classification trees used for our explorative analyses revealed interesting patterns, especially in combination with gender: women littered less, especially when neutral eye images were present. Overall, neutral eyes seemed to be somewhat more effective in preventing littering. One reason accounting for why neutral eyes were more effective in our study might relate to specific emotional associations triggered by intense eyes such as fear or avoidance, similar to how defensive avoidance might occur when confronted with fear appeals (Tannenbaum et al., 2015; Higbee, 1969). That is, intense eyes might evoke an avoidance reaction, instilling the goal to get rid of the flyer as soon as possible.

Another explanation might relate to ‘reactance’ (i.e., people ‘rebellling’ against the system and therefore purposefully displaying undesired behavior). In the classification trees,

intense eyes seemed to be about as effective in preventing littering as images of flowers, but the reasons for why these conditions are less effective than neutral eyes, might be completely different. Flower images may not evoke any reaction, while intense eyes might evoke too much of it. On the other hand, and although quite speculative, flower images might trigger a concern for the natural environment, perhaps via that route influencing littering. Clearly, more research is needed to pinpoint the exact mechanisms triggered by these different images.

When we took gender into consideration, we observed another interesting effect: women seemed to be more susceptible to the eye images, whereas men seemed to be more susceptible to the markings. This is consistent with research implying that women generally are more focused on eyes when observing a face, and perhaps therefore more susceptible to eyes and depictions of eyes in general (Bayliss, Pellegrino & Tipper, 2005). As for why police markings generally caused more littering for the male participants, one can only speculate, but perhaps reactance (more prevalent in men compared to women; Woller, Buboltz & Loveland, 2007) is part of the answer.

The other (additional) variables we measured were whether or not participants looked at the flyer briefly or for a longer period of time, and whether or not the participants were engaged in social behavior or other activities when they were confronted with the flyer. Specifically, we found that when participants looked at the flyer for longer than two seconds, they were most likely to take the flyer with them. Arguably, when looking at the flyer for a shorter time (i.e., less than 2 seconds), littering can be considered an intuitive, automatic response (not involving cognitive information processing), whereas longer viewing times are more likely to trigger cognitive reasoning and hence a decision to act 'appropriately' and in line with social conventions.

In conclusion, the study presented confirms the effectiveness of watchful eyes as a means to prevent littering in public space. At the same time, our findings call for follow-up studies zooming in on the mechanisms involved in order to fully grasp how watchful eyes influence littering under different circumstances (e.g., when alone or with others), under varying exposure times (brief or prolonged exposure), and for different people. Insights in these underlying psychological processes (e.g., when and why do people diffuse responsibility by placing flyers on another bike?) are essential for policy making aimed at reducing an altogether serious, highly undesirable, and harmful phenomenon.

Chapter 5

The influence of persuasive garbage bin design on behavior

In this chapter we tried to extend the principles of the lab experiments we conducted in chapter 3 to an outdoor situation. We were interested to see whether the presence of a camera or a mirror would deter littering in a real-world setting. To this end we conducted two field experiments for which we integrated a mirror and a security camera into the design of garbage bins used around the campus of the University of Twente. Each of these experiments had a distinct setting in which we tested the garbage bin designs: the first experiment involved adolescents who were visiting the campus for an event, the second experiment involved students and employees of the university who are familiar with the campus. For the first experiment we distributed a can of coke amongst our participants which could prompt littering, for the second experiment we handed out a flyer of a sports club.

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Litter is often found in public places. In 2010 the costs for the prevention and removal of litter amounted to approximately € 250 million per year (Deloitte, 2010). In addition to the fact that many people find litter an unpleasant sight, it is also harmful to the environment: people or animals could get hurt stepping in sharp objects, and plastic can end up in the oceans. Visible litter could even give the impression that undesirable behavior is acceptable in an environment, and thus cause more serious crimes in turn; an assumption in line with the Broken Windows Theory (Wilson & Kelling, 1982), and corroborated in a variety of field experiments (eg. Keizer, Lindenberg & Steg, 2008; Keuschnigg & Wolbring, 2015; Ramos & Torgler, 2009).

As littering is generally considered to be a type of undesirable, norm-violating behavior (Robinson, 1976; Chekroun & Brauer, 2002), considerable efforts are dedicated to prevention of littering. A classical way to deter undesirable behavior such as littering is to warn people they might be fined when they are caught. This approach is based on the Rational Choice perspective (Cornish & Clarke, 1986), which implies that an individual makes a rational cost-benefit calculation before committing a transgression, contrasting the costs/risks and benefits of a particular action. Following this line of reasoning, raising fines would reduce littering due to fear of punishment. However, the Rational Choice perspective has been severely criticized for being overly simplistic (e.g., Green & Shapiro, 1994). Indeed, in the case of littering, fines do not seem to be very effective (Dwyer, Leeming, Cobern, Porter & Jackson, 1993).

Possibly a more effective method of reducing litter is the placement of garbage bins. A series of experiments by Finnie (1973) showed that the proper placement of a sufficient number of trash bins can lead to a substantial reduction in litter. Additionally, according to experiments conducted by O'Neill, Blanck and Joyner (1980) and Geller, Brasted and Mann (1980), visual salience and eye-catching designs may also reduce littering. In fact, over the years, there have been considerable efforts to design garbage bins that persuade people to throw their rubbish in by turning littering into a playful or amusing activity. An example of this are trash bins resembling huge butterfly-nets, designed to 'catch' the cans people throw in from their bike or car. Not just the garbage bin itself could be designed in a persuasive way, but the environment could give subtle hints as well. An example for this is the placing of colorful footsteps on the pavement, directly leading to the trash bins (see Hansen & Jespersen, 2013). These types of environmental cues which subtly remind and 'seduce' people to behave properly are also referred to as 'nudges' (Thaler & Sunstein, 2009). In contrast to rational approaches based on fear of punishment, the effectiveness of nudging is generally traced to its more playful or lighthearted character through which people are subtly persuaded to display the desired behavior (e.g., Saghai, 2013). Nudges can also persuade people to behave properly by subtly reminding them of social norms (e.g., Cheung, Kroese, Fennis & De Ridder, 2017).

The Focus Theory of Normative Conduct (Cialdini, Reno, & Kallgren, 1990; Kallgren, Reno, & Cialdini, 2000) states that norms affect human behavior when the norm has been made

salient. Norm activation could be achieved using several techniques, depending on the type of norms. That is, norms can be descriptive or injunctive: a descriptive norm refers to what most people do in a certain situation, while an injunctive norm refers to how people should act according to a certain culture. For instance, someone picking up trash right in front of you would remind you of the descriptive norm, while a sign reminding people to protect the environment would remind you of the injunctive norm. A descriptive norm is usually specific to a situation and therefore hard to transfer to other situations. For example, experiments of Kallgren et al. (2000) showed that the descriptive standard only brought about a reduction in littering when the environment was clean. Hence, in situations where control over the environment is difficult to achieve (e.g., in crowded areas where behaviors of individuals are hard to predict), reminding people of the injunctive norm might be a more effective and consistent way of reducing litter. In the current study we therefore investigated to what extent injunctive norm activation through persuasive trash bin design reduces littering in a public setting. Before elaborating on the details of this study, we will first zoom in on the key constructs involved.

Norm activation and littering

Traditional ways of norm activation are usually quite explicit; for instance by placing posters or (warning) signs reminding people of the injunctive norm through text or visualizations (e.g., a visualization of a person throwing an empty bottle in a garbage bin). Recently, more implicit ways of injunctive norm activation have come to the fore. One popular measure is the placement of cameras, monitors or mirrors in stores (e.g., at the entrance or near beauty products). The underlying assumption is that such measures make people more self-aware and encourage norm-congruent behavior (e.g., preventing undesirable behavior such as theft). Research in social psychology suggests that norm-congruent behavior can be encouraged both by making people feel watched by others, and by making people watch themselves (e.g., Wicklund and Duval, 1971; Govern and Marsch, 2001).

The Social Impact Theory by Latané (1981) implies that the (imagined) presence of others can be regarded as a social force, ultimately affecting behavior. A possible explanation for this phenomenon is that the presence of others (real, anticipated or imagined) induces the feeling of being evaluated, encouraging self-evaluation and impression-management (Leary & Kowalski, 1990). This may result in behavior adjustments with the aim of presenting a socially desirable image to the outside world. Wicklund and Duval (1971) did indeed find that participants who were confronted with a television camera pointed at their face changed their opinion on different matters in the direction of 'correctness'. A typical category of norm-congruent behavior that is likely to carry away others' approval, is pro-social behavior (Kallgren et al. 2000), like cleaning up litter or 'helping others'. In line with these notions, research by Van Rompay et al. (2009) showed that people who are in a room with a security camera (i.e., an implied presence) offered more help to a researcher than participants in a room without a security camera.

Interestingly, research by Govern and Marsch (2001) shows that not just the (implied) presence of an external audience can make people feel more self-aware, but that similar effects occur when people are confronted with their own image. For instance, classic studies in social psychology showed that when participants are seated in front of a mirror (and hence, when there is no one watching but the participants themselves), they are more self-aware (Wicklund, 1979), and might thus be more likely to display norm-congruent behaviors. Kallgren et al. (2000) also demonstrated a similar effect for participants who watched themselves on a monitor; they littered less (so they adhered better to social and/or personal norms) compared to participants who did not watch themselves on a monitor. In other words, a focus on the self-image by means of mirrors or monitors can result in a stronger focus on norms and values present in the individual self (Carver & Scheier 1978, Duval & Wicklund, 1972). Wicklund and Duval (1971) call this process self-evaluation, where people being observed reflect on their behavior and subject it to their personal norms and values, resulting in more norm-congruent behavior.

In line with these notions, Ross, Anderson and Campbell (2011) state that the level of self-awareness is influenced by signals from the environment such as mirrors, and that increased self-awareness in turn leads to compliance with socially valued standards. For instance, research from Beaman, Klentz, Diener and Svanum (1979) shows that children more often adhered to the rule to grab only one piece of candy when there was a mirror placed next to the candy, as opposed to when no mirror was present.

Design and norm activation

When applying these combined findings to design, they suggest that objects like cameras (activating the feeling of an 'external' audience) and mirrors (activating the feeling of an 'internal' audience) could be effective in inciting desirable behavior.

Of particular relevance to the current undertaking, De Kort, McCalley, and Midden (2008) tested the effectiveness of mirrors (aimed at reducing littering behavior implicitly) placed directly above trash bins. They compared the effect of the mirrors with more explicit anti-littering signs. Both mirrors and signs were intended to activate the injunctive anti-littering norm; the signs did this explicitly, the mirrors implicitly. Both measures reduced littering up to 50%, suggesting that mirrors can be as effective as anti-littering signs. Although these findings testify to the potential of combining environmental cues with traditional trash bins, research so far has been conducted with cues which are located near to the trash bin, but not integrated into the design of the trash bin itself. For instance, in the study by De Kort et al. (2008), the mirrors were placed above the trash bins, which made them very salient, but this would not be easily applicable to use in a real-life situation as mirrors of this type would be susceptible to damage or theft.

Hence, in this study, we aimed to incorporate these types of cues (i.e., a camera and a mirror) into novel trash bin designs and to test their impact on littering behavior. To test

these designs, we used them in two different contexts and evaluated the effectiveness of the designs.

The current research

The first approach we took in order to explore how garbage bin design might influence behavior is based on the Social Impact Theory (Latané, 1981). We incorporated a security camera into the design of the trash can, in order to make people feel like they are being watched. In line with previous research on the effectiveness of camera presence on norm-congruent behavior, we expected that littering would be less in the camera condition compared to a control condition in which the camera was replaced by a neutral object (a black and white circle). Hence;

H1: A larger percentage of test subjects will throw rubbish in the trash bin in the camera condition than in a control condition incorporating a circle.

The second approach we take in order to explore how garbage bin design might influence behavior is based on the activation of self-awareness via mirrors. We incorporated a curved mirror into the design of the trash can, in order to try to make people more self-aware. In order to test the effectiveness of this mirror-like element (confronting people with their own image), we compared usage of a reflective material with a control condition (in which we used similar material but this time with a non-reflective bumpy surface texture). Based on research showing that self-observation using a mirror could induce norm conformity (e.g., Wicklund & Duval, 1971; Kallgren et al., 2000; De Kort et al., 2008) our second hypothesis is:

H2: A larger percentage of test subjects will throw rubbish in the trash bin in the reflective, glossy material condition than in a control condition incorporating a non-reflective shiny material.

We wanted to put both these lines of reasoning to the test within our experiments, so we would be able to evaluate each method in the same context.

General Methods

We conducted two different field experiments in a university campus setting, to try to get a realistic picture of littering behavior in a naturalistic public area where also other people are present. The aim of these experiments is to observe the behavior of throwing away trash as it normally would take place. We tested the designs in two different situations with a lot of people present, and where trash bins are commonly available. The campus is a very clean and modern environment, generally stimulating an anti-littering norm.

In the first experiment we focused on school children visiting the University campus for an anniversary event. They visited the campus to learn about the wide diversity of studies

conducted at the university, and walked around between several stands on the campus grounds. The target object concerned a small can of coke they received while walking between exhibitions. In the second experiment regular students at the same campus were observed. This time a flyer was distributed among them when they left the common building where the dining hall was located. In both experiments we examined the effect of four different types of trash bin designs on littering (of the can and flyer respectively), and compared them to a control condition with a regular campus trash bin.

In these two field studies, the test subjects were assigned to the various conditions at random, by being present during the time when one of the five trash bin designs was installed for the experiment. We randomly chose the days to test the different designs. We took care to covertly observe from a distance, in order to prevent the subjects from behaving differently because they are aware of the presence of the observers.

For both studies, a test-run of the experiment was conducted to test the observation forms and the general setup of the experimental design. Since there were no unforeseen issues with the design, the experiments proceeded as planned.

Experimental design and conditions

Our experiment consisted of five conditions: a mirror ('mirror') and a shiny cover ('shiny'), a camera ('camera') and a similar tall attachment ('circle'), and a neutral bin without any changes ('regular'), corresponding with the five different designs we put to the test (see figure 5.1 to 5.5).

The trash bins that we used for this research consisted of four different novel creative designs, and we used a regular trash bin as control. The novel trash bins were created at the Faculty of Engineering Technology at the University of Twente.

The first design incorporates a security camera, in order to make people feel like they are being watched. To achieve this, we needed to place the camera pretty high, which would be sensible for a security camera. This design incorporates a long pole with a camera on top of it, and a round metal plate which could be slid under the trash bin, so the pole would be fastened securely and look like a part of the trash bin itself. The camera was pointed at the direct environment of the trash bin (see figure 5.1).

The trash bin we use as a control for the trash bin with the camera also incorporates a long pole into its design, with a black-and-white circle on top, instead of a camera. We use this design as a control condition for the camera design. The circle with the black dot was conceived because we did not want to use any color for this design, and it matches with the design of the logo of the university (see figure 5.2).

Figure 5.1. Camera

Figure 5.2. Circle

Figure 5.3. Mirror

Figure 5.4. Shiny

Figure 5.5. Regular

Inspired by the effectiveness of confronting people with their own image through a mirror, we considered material selection in trash bin design and incorporated a reflective material, which would confront people with their own reflection upon approaching the object. However, the trash bin with the mirror is of a different shape than the normal trash bins. To actually incorporate a mirror into the design of the trash bin instead of simply placing it above the trash bin, we were posed with an interesting challenge. The trash bins we were working with, were supposed to be round, to get as close as possible to the default design of the trash bins which are present at the campus. Also, if the mirror would be placed in a straight angle from the ground, only people's legs would be reflected, and you wouldn't be able to see the reflection when you were standing in front of the trash bin. We needed to adjust the design of the trash bins, so that we could make a surface on the trash bin which would reflect people's face to them, when they are standing in front of the trash bin. We achieved this by adding a wide rim to the trash bin, which reflected upwards. However, the mirror was curved, so the reflection was a bit distorted, though still recognizable as one's own reflection, with visible details in the reflection of one's face (see figure 5.3).

This new shape and shiny design made the trash bin look rather different and possibly more noticeable than a regular trash bin. The trash bin we use as a control for the trash bin with the mirror has exactly the same shape as the mirror trash bin, and also sports a silvery reflective surface. However, this surface does not reflect like a mirror but instead has a bumpy texture, so participants cannot see themselves. If participants looked at it, they could see the colors of the environment reflecting, but the reflection was distorted by the texture so details could not be discerned. As demonstrated in research by Govern & Marsch (2001), mirrors should at least reflect the face in order to activate self-awareness, and seeing your own face or other identifiable details in the reflection was clearly not possible with the bumpy surface. We used this design with the shiny bumpy surface as a control condition for the mirror design (see figure 5.4).

The standard trash bin shown in figure 5.5 is used as a base to add the other designs onto. A casing was placed around this base or a post was placed behind it. In the overview of our data we compared all designs to each other and to the standard trash bin.

Analysis

To test the effect of garbage bin design on behavior, we used Chi Square tests. For our hypotheses, the designs will be compared pair-wise, to match our main manipulation with the most appropriate control condition. A general comparison of all data will be presented as well.

Study 1

Methods

This study took place during the anniversary event 'Experiment in het Bos' (Experiment in the Forest), at the campus of the University of Twente. 'Experiment in het Bos' was a one-time celebratory event for the 50 year anniversary of the university, and was specifically designed to interest children and young adults in science. The test subjects participated in the 'Experiment in het Bos' project. The participants of this study were new at the campus, and therefore they did not know what kind of trash bins they would encounter in this context. For these participants, visiting the campus was a special event. This field experiments took place in a social context, with the children roaming around in groups, and many other people walking around nearby.

We distributed small cans of Coca Cola to the kids, which they had to throw away after drinking it. We chose for cans because they are not easy to take with you after drinking the beverage inside, and it was fitting to the situation to offer the kids something to drink during their stay at the campus.

Participants

A total of 113 subjects were observed with an age ranging from approximately 9 to 15 years. 56 were female and 57 were male. All participants in this study were in year seven or eight of primary school, or in the first or second year of secondary education. The test subjects were recruited by offering them a small can of Coca Cola. From the group of kids who took a can, a number of kids were randomly selected for observation.

Procedure

During the 'Experiment in het Bos' project, groups of pupils rotated between 14 domes on the grounds of the University of Twente, each dome contained a workshop or something similar. We carried out the experiment at the moments that the pupils switched domes. The pupils walked between the domes in a group ranging from 10 to 20 children and a teacher. The domes were connected by a wooden path. A trash bin was placed adjacent to this path between two domes, equipped with one of the five designs. When the children walked from one dome to another, one of the researchers offered the children a can of Coca Cola by asking "Do you want something to drink?" The children who took the can drank the Coke on the spot.

Observations

The observations were conducted by four bachelor students who took part in a research project, and one employee of the university. They were all trained in observing littering behavior before the actual experiment took place by participating in a test-run of the whole experimental set-up. Comparison of observations revealed consensus among the experimenters, therefore we proceeded with this method of observation. During the

experiment, each experimenter randomly selected one or more children to observe in the group which received the cans, and informed the other observants of their choice, so they would not observe the same kids. One experimenter observed the behavior of one, two, or three children simultaneously. The observations were conducted from a distance, where other people who were not a part of 'Experiment in het Bos' were walking and sitting around to eat and relax. The experimenters were sitting in a group nearby, apparently having lunch together while catching up, as to blend in with the other people.

Measures

The main dependent variable (littering) was coded as follows: 1) the can was thrown in the garbage bin, 2) the can was dropped on the ground, 3) the can was taken along by the participant. We did not observe anyone dropping the can on the ground. Taking a can along (instead of throwing it away directly) could mean the can might get littered or left somewhere later, since an empty can is a useless item which is not easy to take with you into your bag or pocket. Therefore, we consider throwing the can away directly into the garbage bin to be the preferred behavior in this situation.

Results and conclusions

We first present a visual overview of all conditions. Of all 113 participants, 61 had thrown their trash away in the garbage bin, while 52 participants took their trash with them. Figure 5.6 below shows how these numbers are distributed among the different trash bin designs. A Chi Square test over all conditions shows there are significant differences between conditions: $\chi^2(1, N = 113) = 12.740, p = .013$. No effects for gender and group size were found.

Figure 5.6. Percentage of trash thrown into the trash bins

Five of the 20 participants in the camera condition threw their can in the garbage bin (25%), while 15 of the 22 participants in the circle condition threw their can away (68%).

In the mirror condition 13 of the 20 participants threw their can in the garbage bin (65%), while 10 of the 24 participants in the shiny condition threw their can away (42%). In the condition with the unmodified garbage bin, 18 of the 27 participants threw their trash into the garbage bin (67%).

Testing our hypotheses

To test our first hypothesis, we checked whether a garbage bin design incorporating a camera would lead to more people throwing away their trash in the garbage bin, compared to the control condition incorporating a circle. We compared the 'camera' condition with the 'circle' condition. The dependent variable we used was 'throwing away trash'. We used a Chi Square Test, which yielded a significant difference between the 'camera' and the 'circle' condition: $\chi^2 (1, N = 42) = 7.832, p = .005$. However, participants threw away their trash significantly less often in the 'camera' condition compared to the 'circle' condition, thus we could not confirm our hypothesis 1. According to our results we can draw the conclusion that a camera incorporated into the design of a trash bin discourages people to throw away trash into that garbage bin.

To test our second hypothesis we checked whether a garbage bin design incorporating a mirror would lead to more people throwing away their trash in the garbage bin, compared to the control condition incorporating a shiny, bumpy reflective texture. The dependent variable we used was 'throwing away trash'. Although participants threw away their trash slightly more often in the 'mirror' condition compared to the 'shiny' condition, there was no significant difference between these two designs ($\chi^2 (1, N = 44) = 2.381, p = .123$). Thus, we cannot confirm our hypothesis 2. According to our results we can draw the conclusion that a mirror incorporated into the design of a trash bin does not persuade people to throw away trash into that garbage bin, compared to a shiny trash bin with the same design elements as the garbage bin with the mirror surface.

The participants did not have a significant preference for the design trash bins over the regular trash bin or vice versa ($\chi^2 (1, N = 113) = 2.298, p = .130$); usage of the design garbage bins was 50% overall, usage of the regular garbage bin was 67%.

Study 2

Methods

This study took place during a normal weekday at the campus of the University of Twente. Presumably, the majority of participants of this study were regulars at the campus, and would therefore know the campus well. The participants of this study were most likely familiar with the kind of trash bins they could encounter in this context. This field experiments took place in a social context, with many students and employees of the university roaming around, eating their lunch, and walking around nearby.

We distributed flyers containing information about a sports club at the university: a survival sports club, sporting the logo of the club, textual information, and a website address. We chose flyers because it was appropriate for the situation: flyers often get distributed at the university's grounds, especially during late spring and early summer, when this study took place, and littering of flyers is a widely acknowledged problem.

Participants

A total of 596 subjects was observed with an estimated age ranging from 17 to 35 years. Subjects were recruited on the grounds of the University of Twente. Flyers were distributed to the students who entered a plaza in between the university buildings and the lunch restaurant. Many people visit this plaza around noon, to eat their lunch, socialize, and enjoy the sun. The test subjects consisted of the group of students who accepted a flyer when offered by a fellow student.

Procedure

In front of the exit of one of the university buildings, 60 flyers per day were distributed among the students who walked towards the plaza around lunchtime. One of the five trash bin designs was placed on the plaza per session (see figures 1 to 5). All designs were tested in two separate time slots. A team of four bachelor students who took part in a research project conducted these observations. One or two experimenters handed out flyers to the students at the exit of the building, while the other experimenters observed from a distance and recorded the behavior of the students who had accepted a flyer. The experimenters who were observing were clustered together and blended in their environment, apparently relaxing and talking to each other on the busy plaza.

Measures

The main dependent variable (littering) was coded as follows: 1) the flyer was thrown in the garbage bin, 2) the flyer was dropped on the ground, 3) the flyer was taken along by the participant. Taking a flyer along (instead of throwing it away directly) could mean the flyer might get littered or left somewhere later. Therefore, we consider throwing the flyer away directly into the garbage bin to be the preferred behavior in this situation.

We observed only four participants who dropped the flyer on the ground. Since this behavior was so rare (i.e., it was observed four times only), we decided to omit these cases from our analysis. However, it might be noteworthy that all of these cases occurred in the 'circle' condition.

Results and conclusions

We will first present a visual overview of all condition. Of all 596 participants, 82 had thrown their flyer away in the garbage bin, while 514 participants took their flyer with them. Figure 5.7 below shows how these numbers are distributed among the different trash bin designs. A Chi Square test over all conditions shows there are significant differences between conditions: $\chi^2(1, N = 596) = 10.465, p = .033$. No effects for gender were found.

Figure 5.7. Percentage of trash thrown into the trash bins

A total of 13 of the 120 participants in the camera condition threw their flyer in the garbage bin (11%), while 16 of the 116 participants in the circle condition threw their flyer away (14%) (in the circle condition, four flyers were littered). In the mirror condition 12 of the 120 participants threw their flyer in the garbage bin (10%), while 14 of the 120 participants in the shiny condition threw their flyer away (12%). In the condition with the unmodified garbage bin, 27 of the 120 participants threw their trash into the garbage bin (23%).

Testing our hypotheses

To test our first hypothesis we checked whether a garbage bin design incorporating a camera would lead to more people throwing away their trash in the garbage bin, compared to the control condition incorporating a circle. We compared the 'camera' condition with the 'circle' condition. The dependent variable we used was 'throwing away trash'. We used a Chi Square Test, which did not yield a significant difference between the 'camera' and the 'circle' condition: $\chi^2(1, N = 236) = .479, p = .489$. Participants did not throw away their trash more often in the 'camera' condition compared to the 'circle' condition, therefore we found no support for hypothesis 1. When looking at the visualized data, and consistent with the outcomes of experiment 1, it seems participants tended to throw away their trash slightly more often in the garbage bin with the 'circle' design. According to our results we can draw the conclusion that a camera incorporated into the design of a trash bin does not persuade people to throw away trash into that garbage bin.

To test our second hypothesis, we checked whether a garbage bin design incorporating a mirror would lead to more people throwing away their trash in the garbage bin, compared to the control condition incorporating a shiny, bumpy reflective texture. We compared the 'mirror' condition with the 'shiny' condition. The dependent variable we used was 'throwing away trash'. We used a Chi Square Test, which did not yield a significant difference between the 'mirror' and the 'shiny' condition: $\chi^2(1, N = 240) = .173, p = .678$.

Participants did not throw away their trash more often in the 'mirror' condition compared to the 'shiny' condition, thus we cannot confirm our hypothesis 2. According to our results we can draw the conclusion that a mirror incorporated into the design of a trash bin will not persuade people to throw away trash into that garbage bin, compared to a shiny trash bin with the same design elements as the garbage bin with the mirror surface.

In contrast with experiment 1, here, the participants did have a significant preference for the regular trash bin over the design trash bins ($\chi^2(1, N = 596) = 9.677, p = .002$); usage of the design garbage bins was 12% overall, usage of the regular garbage bin was 23%.

General Discussion

The purpose of this research was to investigate the effect of the design of trash bins on littering behavior. Extending on previous research, our objective was to incorporate several cues which could nudge people into behaving properly into the design of the trash bins itself, and make it seem like the cues were a part of the overall design of the trash bin. With these integrated designs, we tested whether or not there was an effect on behavior.

Participants did not throw their trash more often away in the garbage bin in the camera condition, compared to the circle condition. Interestingly, the effect seemed to be reversed: in study 1 the participants threw their trash significantly more often in the trash bin with the circle design, compared to the trash bin with the camera. In study 2 there was no significant difference between these two conditions, however, the visualized data implies the trash bin with camera was indeed used less often compared to the design with the circle. A possible explanation might be that the subjects felt more anxiety in the vicinity of the camera and therefore tried to avoid the trash bin. The study by Reno, Cialdini and Kallgren (1993) proposed that an injunctive norm motivates action by the threat or promise of social punishment, which might cause the avoidance of cameras. It could also be the case that the circle design (which was a white circle with a black dot in the middle) resembled an eye, which, according to the studies by Bateson et al. (2006), might trigger pro-social behavior as well. However, the simplest design which seemed to trigger the effect of eyes were three black dots in an eye-like configuration (Rigdon, Ishii, Watabe & Kitayama, 2009), not a black dot by itself.

In both of our studies we did not find a significant effect of incorporating a mirrored surface into the design of the trash bins, compared to a similar design without the mirror effect. These results are inconsistent with the results of field research by De Kort et al. (2008) in which the amount of clutter decreased by 50% when a mirror was placed above a trash bin. A possible explanation for this difference is the placement and curvature of the mirror in our study. It might be possible that the effect of a mirror is more explicit when a mirror is placed in such a way that the reflection is at eye height and not in any way distorted.

However, looking at the visualized data of study 1 and study 2, an interesting contrast appears. In study 1, the mirrored trash bin did seem to be more effective, but there was no significant difference. However, in study 2, participants threw their flyer more often in the shiny trash bin, compared to the mirrored one. Arguably, the shiny bin shows a greater resemblance to the default trash bin compared to the mirrored trash bin as the default trash bin features a bumpy surface as well (but is painted dark green instead of silvery). Alternatively, one could argue that the mirrored trash bin looked very new, clean, and more like an artistic object; rather different from what people would expect when they search for a trash bin. Hence, they might have found it difficult to quickly recognize the object as a trash bin.

Similarly, the participants of study 2 show a significant preference for the regular trash bin, instead of the novel designs. A possible explanation for these combined results is the relationship between attention and product categorization. Garber (1995) describes in this context a model in which the influence of the appearance of a product on consumer attention and on product categorization is emphasized. Garber states that in order to be considered by a consumer, novel product packaging must pass a check of appropriateness for the category they are looking for, or should clearly be compatible with performance needs and goals. Cohen and Basu (1987) state that categorization involves comparing a subject with categorical knowledge. Schoormans and Robben (1996) argue that products can become unacceptable to consumers when the appearance of the product is no longer representative of the product. In other words, the test subjects may have (implicitly) perceived the design conditions as not representative of a trash bin, perhaps explaining why less use was made of the trash bins with the novel designs. Research by Snelders, Hussein, Lea, and Webley (1992) shows that the more typical a stimulus is, the faster people answer the question whether it belongs to a certain category. Schoormans and Robben (1996) discuss in this context a study by Rosch (1978) in which it is stated that more typical stimuli elicit the strongest associations with a category, and therefore the quickest can be retrieved from memory.

Overall, there are several interesting differences to note between the findings of study 1 and study 2. A much bigger percentage of participants threw away their litter during study one, compared to study two. This might be due to the fact that an empty can is pure trash, and not easy to carry around in your bag or pocket after you are done with it. A flyer, however, is supposed to be taken with you, and easy to put into your bag or pocket; one might even plan to read the information at a later moment. Another notable difference is that in study 2, the standard trash bin seemed to be much more popular than all the novel designs. The participants of study two consisted of people who were daily visitors of the university grounds, and therefore presumably familiar with the standard trash bin design which is distributed everywhere on the campus grounds. Hence, when they are looking for a trash bin to dispose of their garbage, they know exactly what design they are supposed to be looking for. The participants of study 1 were new on the campus and were

not familiar with the trash bins. In the visualized data, it is clear that the default design does not perform better than the design with the circle, or the design with the mirror. Interestingly, the design with the mirror was much more effective in study 1 compared to study 2. Maybe this was caused by the fact that the mirror looked even more unusual than the shiny design, prompting the participants to take a closer look, and thus making it easy for them to throw their trash away once they discovered the shiny object was a trash bin. Another notable result of this study was that only four participants threw their trash on the ground. Arguably, the clean environment of the campus and the public setting might have contributed to this.

To conclude, this study shows that incorporating elements which prove to be effective against littering into the design of a trash bin, is not to be done carelessly and without testing. Our research shows that if a design deviates too much from the familiar design the regular visitors of an area are comfortable with, the new designs will not be used as frequently as the old design. However, when people are unfamiliar with the standard design used for a trash bin, some novel design choices seem to be equally acceptable as a standard design, although the results from this study revealed none of the novel designs are significantly more effective than a regular trash bin. This might be due to the mental image people have of what they are looking for when they search for a trash bin, and therefore it would be advisable that new designs do not deviate too much from the standard design of a trash bin. However, should the novel designs be tested for a longer period of time (e.g., for a few weeks), it might be possible that people will become familiar with the new garbage bins and therefore no longer see them as novel, atypical designs, and use them more often.

Chapter 6

General Discussion

The aim of this dissertation was to gain insight into how environmental factors (e.g., cues of being watched and disorder) influence the occurrence of undesired behaviour (e.g., littering and cheating) in both outdoor and indoor settings. As such, the work presented in this dissertation consists of five experiments, in which I examined how the physical environment directs undesired behaviour, and which psychological processes might be involved. To gain further insights into the psychological mechanisms underlying undesired behaviour, I examined whether personality factors could influence the effect of environmental factors on behaviour.

Physical elements in the environment can have considerable impact on the psychological mechanisms underlying undesired behaviour (e.g., North, Hargreaves, & McKendrick, 1999; Valenzuela & Raghurir, 2009). In my studies, such environmental elements included surveillance cameras, mirrors, and images of eyes. The personality traits I focused on all relate to people's sensitivity to (social) cues in the environment. For instance, people differ in the extent to which they are sensitive to the opinion of others. For example, Locus of Control (Rotter, 1966) indicates whether someone believes the environment or one's own behaviour directs the outcome of their actions. Need for Approval (Straham & Gerbasi, 1972) reflects the extent to which an individual adjusts its behaviour in order to make a good impression on others. Self-Monitoring (Snyder & Gangestad, 1986) indicates whether people adjust their behaviour in accordance with their self-image. I investigated whether differences in these traits also surface in the way people react to subtle cues embedded in the environment.

Across five experiments I tried to gain insight in the way elements embedded in the environment can influence behaviour, specifically undesirable behaviour. In addition to studying the effect of surveillance cameras, mirrors, and images of eyes, which are assumed to discourage undesirable behaviour, I started out by studying the effects of disorder, which is generally assumed to stimulate undesirable behaviour. The principle of Social Proof (see Cialdini, Reno, & Kallgren, 1990) states that disorder in the environment stimulates more disorder in turn, as people are encouraged by available evidence (i.e., 'social proof') that others have engaged in disorder-enhancing behaviours as well (Cialdini et al., 1990). The Broken Windows Theory (BWT, Wilson and Kelling, 1982) expands on this principle, stating that signs of rule-breaking behaviour in the environment could attract all kinds of other types of undesirable behaviour. This theory was tested in an experimental setting by Keizer, Lindenberg and Steg (2008), and found to be applicable to many outdoor situations. Building on the research of Keizer and colleagues (2008), I have investigated whether this effect holds up in an indoor setting. Additionally, I studied a different kind of transgressive behaviour, particularly prominent in an indoor setting: cheating.

Controlled lab experiments combined with questionnaires allowed me to examine the influence of these two types of environmental cues (i.e., both disorder and specific objects

triggering perceptions of being watched) and the role of personality traits related to the perception of the environment and impression management. Specifically, by measuring personality traits using validated questionnaires, I could assess their influence on actual behaviour in an experimental setting. In the final part of my research, I switched from the lab to the real world to test whether the effects of environmental manipulations as tested in a lab environment would also uphold in everyday social settings. I did this by introducing elements to the environment which were specifically designed to trigger the impression of being watched.

With my research I tried to integrate and test theories from both the domains of psychology, sociology and criminology. I tried to explore the psychological mechanisms behind these theories, for which I considered and examined both rational and more intuitive processes.

Summary of the main findings

Chapter 2: Study 1

In my first study, I and my co-authors wanted to test the effect of disorder on undesired behaviour in an indoor office setting. We also tested the effect of social control through the presence of a camera. We tested whether or not littering would be higher in a disorderly than orderly office environment and if cheating would be higher in a disorderly than orderly office environment (spill-over effect). Additionally, we examined whether the presence of a camera would inhibit the detrimental effect of a disorderly environment on undesired behaviour. Finally, we explored whether or not participants with an external LOC would be more strongly influenced by the environment than participants with an internal LOC.

As expected, our findings provide support for the effect of social proof (Cialdini et al., 1990): people littered more in a disorderly, messy environment. Furthermore, we also found a spillover-effect of disorder on cheating behaviour, but only for individuals who had an external rather than an internal locus of control. Hence, the same principles as theorized in the BWT still seem to apply to an indoor office setting, but the effect of the environment is less straightforward as it depends on personality. Interestingly, this interaction effect was most pronounced in that people with an external LOC cheated less in an orderly room.

We did not find any effects of camera surveillance on littering or cheating among participants. Thus, our results indicate that merely the presence of a camera might not prevent undesired behaviour, at least not in the specific setting we used. Our results revealed that the presence of a camera did influence the notion of being watched, but this did not stop our respondents from littering or cheating. Additionally, our finding that

people who lied were more depleted when there was a camera present indicates that the presence of a camera did have an effect, albeit not on a behavioural level. Depletion of mental resources could make people more susceptible to falling back into hedonistic-type behaviour (e.g., Janssen, Fennis, Pruyn, & Vohs, 2008; Mead, Baumeister, Gino, Schweitzer and Ariely, 2009).

To further investigate effects of camera surveillance and the feeling of being watched, in study 2 we zoomed in on the framing of camera presence.

Chapter 3: Study 2

Because the effectiveness of camera surveillance seems rather variable and based on context (Welsh & Farrington, 2002; 2009), we wanted to test different methods of presenting surveillance in an experimental setting, expecting that the ‘framing’ of camera surveillance would make a difference. We examined this by comparing a situation with a camera presented in an authoritative manner, a camera presented in a way suggesting the participant is being evaluated by others, and a camera with a monitor where participants could watch themselves. All of these conditions were compared to a situation without a camera present.

The results from this study do not only support the popular notion that camera presence decreases undesired behaviour such as cheating, but also support the idea that framing of a camera’s presence influences this particular behaviour, and thus shows that framing of camera presence is important. The presence of a camera presented in a non-intimidating and non-authoritative manner reduced cheating behaviour slightly, but not significantly. However, as expected, cheating behaviour decreased significantly when the camera was presented in an intimidating, authoritative manner.

Interestingly, a monitor on which people could view themselves was just as effective in preventing cheating behaviour as a camera presented in an authoritative way. Since there was no risk of getting caught and the effect of the camera itself was presumably negligible in this condition, the preventive effect of participants viewing themselves is likely due to more implicit self-confrontational processes, in which people might reflect on their own norms and values (e.g., Wicklund, 1979). This seems to indicate that there are different processes in which cues of being watched could influence behaviour.

Although we did find an effect of camera surveillance on cheating, we did not find significant effects of camera surveillance on pro-social behaviour, nor on littering behaviour. Arguably, people might not have had the impression that they would be reprimanded for littering in this specific type of setting (in which a certain level of disorder is not uncommon). Whereas cheating is a more severe type of undesirable behaviour; people are generally very aware that cheating is not allowed, especially students taking tests. Additionally, pro-social behaviours like donating money or helping others might

not readily transpire in controlled environments (such as the experimental setting for this study); and the presence of cameras in this context might not stimulate a desire to engage in desirable behaviour.

Looking at personality traits using a decision tree analysis, we found an indication that people with an internal locus of control (those believing the outcomes of their actions are mainly decided by themselves, as opposed to chance or luck) are more inclined to cheat when there is no camera present, compared to people with an external locus of control. This is in line with previous research, showing that people with an internal locus of control cheat more often on skill-based tasks (Whitley, 1998).

In study 3 we wanted to test whether the principles we tested in this study would also apply to a public outdoor situation, where people would be anonymous and unaware of participating in an experiment.

Chapter 4: Study 3

In this field study we moved from an indoor to an outdoor setting, where we studied whether the mere suggestion of being watched would suffice to deter people from littering. To this end, we used images of eyes instead of cameras to emulate social control. Images of eyes are a cheap and convenient way of representing social control, without the need for infrastructural changes to implement CCTV. Littering is a type of undesirable behaviour which is a common problem in outdoor social spaces. Several studies (e.g., Bateson, Nettle & Roberts, 2006) have indicated that images of eyes caused people to behave more properly, similarly to the effect of cameras or mirrors. We wanted to examine if the suggestion of authority added to these images would change the effectiveness of the eye images, similarly as what we did in the lab, by adding the suggestion of authority to camera surveillance.

Specifically, we tested if images of eyes would deter people from littering, and whether different types of eyes (intense or neutral gaze) and the suggestion of authority would influence the effectiveness of these images. To this end, posters and flyers were designed with in total six different combinations: neutral eyes, intense eyes and flowers combined with either police markings or neutral markings. We placed these flyers on bicycles at a bike parking at the University of Twente campus, and placed several posters displaying the same image around the bike parking as well. Subsequently, we observed whether or not the flyers were littered, and whether people performed other actions (e.g., placing the flyer on another bike).

Littering occurred frequently in this study: around 50% of observed participants littered. But interestingly, we also observed other behaviours: attaching the flyer to another bike or object, or ignoring the flyer completely. Since both of these behaviours take much more effort than just dropping the flyer on the ground, we considered this to be a unique type of

behaviour, which we analyzed as a separate category. It was intriguing to see that littering behaviour proved to be much more complicated than we originally expected: leaving the flyer on another object was very common. Arguably, by putting in some effort into leaving a flyer on someone else's bike, people succeed in disposing of the flyer quickly and conveniently, while not having to stoop down to outright littering, which is generally seen as undesired behaviour. Hence, by transferring the responsibility to someone unknown, people manage to uphold a positive self-image by not littering themselves. This could be considered to be a form of 'diffusion of responsibility' (Darley & Latané, 1968).

Images of eyes were effective in preventing littering, but there was no significant difference between images of intense and neutral eyes. A tree analysis revealed that neutral eyes were slightly more effective, and that women were more susceptible to eye images than men. Since women tend to look more to eyes in general (Bayliss, Pellegrino & Tipper, 2005), it is likely that they are quicker to notice and react to the eye images. When participants looked at the flyer for longer than two seconds, they were most likely to take the flyer with them.

Flyers incorporating police markings seemed to stimulate littering, instead of preventing it. A tree analysis indicated that police markings generally caused more littering for the male participants. These results might indicate that intimidating and authoritative signalling might have an adverse reaction, in regard to littering behaviour. Authoritative images might trigger reactance; people 'rebellling' against the system and therefore purposefully displaying undesired behaviour (e.g., Woller et al., 2007).

The images of eyes and the suggestion of authority used in this experiment to test whether they dissuaded littering, seemed to work differently than the surveillance cameras and monitor we used in our lab experiments. In study 4 we studied littering again, but this time we used cameras and mirrors trying to dissuade people from littering.

Chapter 5: Studies 4 & 5

In two studies, we tested whether a camera or a mirror integrated in the design of trash bin would dissuade littering. We studied littering in a social outdoor space at the campus of the University of Twente. We wanted to test whether the effects of camera presence and people watching themselves on a monitor as we observed in the lab, would also uphold in an outdoor setting. For this we used trash bins, and integrated either a camera or a mirror in its design. We compared these novel trash bins to a regular trash bin. In study 4 we tested the designs with newcomers on the campus, and in study 5 we tested the designs with people who are familiar with the campus.

Surprisingly, the results of our first experiment (with people who are unfamiliar with the campus) show that a design incorporating a camera dissuades people to use it, compared to a similar design without camera. Our second experiment with people who are familiar

with the campus did not show a significant difference between the design with the camera and the similar design without camera. In both of our experiments we did not find a significant effect of incorporating a mirrored surface into the design of the trash cans, compared to a similar design of a shiny trash can without the mirror effect.

Interestingly, combined findings suggest that people who are familiar with the campus (experiment 2) used the trashcan with the regular design more often than the trashcans with novel designs, while people unfamiliar with the campus (experiment 1) did not entertain this 'preference'. Arguably, regular visitors are used to the standard design, and look around for a trashcan which fits this image. The novel designs might have been too atypical, not only hindering identification and object categorization, but possibly also evoking associations with art objects, which may inhibit use (see Schoormans and Robben, 1996).

General Conclusions

Taken together, our studies result in three main conclusions, answering the both the sub-questions and the main research question as formulated in the introduction of this dissertation.

First, we found further proof that in an indoor environment disorder is indeed 'contagious' and has undesirable effects, most directly on littering. However, our findings also suggest that especially for a spill-over effect to more severe behaviour -such as cheating- personality factors such as one's locus of control play a crucial role. This provides an answer to my first sub-question: *'To what extent does a disorderly environment influence undesired behaviour, and how does personality play a role in this?'*

Second, great care should be used when introducing the suggestion of social control to an environment, as not all measures studied work equally well to prevent littering and cheating. While camera presence and the possibility to observe oneself can reduce cheating when framed correctly, these measures do not have a preventative effect on littering. Furthermore, the suggestion of the presence of authority could have a negative effect, as it might evoke reactance or avoidance of an area. The personality traits we measured did not have an effect on the effectiveness of camera presence. However, the presence of eye images did seem to influence women more than men, leading to slightly less littering. Taken together, this provides an answer to my second sub-question: *'To what extent do cues of being watched influence behaviour, and how does personality play a role in this?'*

Third, both our first study incorporating a subtle camera and our second study which focused on camera surveillance showed that the framing of the presence of a camera matters greatly with regard to the effectiveness of camera surveillance in an indoor

setting. While the presence of a camera can be used to prevent cheating, it is only effective when it evokes the feeling of a watchful authority, or when participants are confronted with their own image. Camera presence by itself does not reduce cheating, even when the camera is very noticeable. These findings suggest that two different psychological mechanisms could play a role with regard to the presence of cameras or mirrors: first, authority and conformity to prevailing standards (external, being watched); and second, self-confrontation and reflection on own standards (internal, watching oneself). For an outdoor setting we found that the presence of images of eyes helped to diminish littering, but should not be combined with cues of authority in order to be most effective. Cues of authority seem to elicit more littering by male participants, which might be explained by reactance against authority, a tendency mostly seen in males (e.g., Woller et al., 2007). Altering the design of garbage bins to include cues of being watched seemed to be counterproductive, since people generally avoided these altered designs; especially the design incorporating a camera. Taken together, these findings provide an answer to my third sub-question: *'What would be an effective way to implement cues of being watched, and how to effectively represent cues of being watched in an indoor/outdoor setting?'*

Overall, we can conclude that although social cues from the environment do influence undesirable behaviour, that framing and context of these cues matters greatly for the effectiveness of these cues in changing behaviour. Furthermore, not all behaviour is affected similarly by the same cues. This answers our main research question: *'How do social cues from the environment influence undesirable behaviour?'*

Theoretical insights

Next to the answers to our research questions, we have also gained some interesting theoretical insights from the results of our studies. These insights might inspire future research and further increase understanding about the psychological mechanisms behind undesired behaviour and the effects of cues of being watched on behaviour.

Our studies suggest that psychological mechanisms underlying relatively common undesirable behaviour like littering seems to be different than for more severe forms of undesired behaviour like cheating. The willingness to cheat seems to be influenced more by personality factors and by environmental manipulations designed to enhance the suggestion of being watched. Although images of eyes were somewhat conducive in preventing littering, contextual factors like the presence of a recognizable garbage bin or a flyer piquing interest seemed to be more relevant.

Littering appeared to be not as straightforward as we originally assumed; instead of either dropping a flyer on the ground or taking it with them, people put a lot of effort in placing a flyer on another object instead of just littering. This behaviour could perhaps be explained

along the lines of the observations of Mazar, Amir, and Ariely (2008), which showed that people generally think a little bit of cheating is okay, but a lot of cheating is considered to be unacceptable. This kind of reasoning could arguably apply to several kinds of undesired behaviour, such as littering. If this is the case, then people are willing to put serious effort into maintaining a positive self-image. This could be explored further by manipulating the amount of effort people have to go through to maintain a positive image. For instance, one could explore how far people would go to leave their trash at an 'acceptable' location. Learning more about this phenomenon might yield more insight into the mechanisms underlying undesired behaviour.

In the context of our studies, pro-social behaviour did not seem to be influenced by the same mechanisms as undesired behaviour. In theory, both refraining from undesired behaviour and displaying pro-social behaviour will facilitate creating a positive self-image or presenting a positive image to an onlooker. However, the drivers behind these behaviours are generally very different. Undesirable behaviour can be motivated by laziness (littering) or greed (cheating), while pro-social behaviour makes people feel good about themselves when they are helping people, or create a favourable impression on others. People are not always consciously trying to manipulate their image when they just do what feels right in that situation.

Based on our studies, it is difficult to make a statement about whether it is a conscious or subconscious process through which people are influenced by the environment, or whether these processes could work in parallel alongside each other (e.g., see Van den Bos, 2018). However, in the presence of a camera, detectability of undesired behaviour seems to be a more important factor than the seriousness of behaviour. This finding could point at rational processes playing an important role. We demonstrated in study 2 that, in the presence of a camera, participants never continued working on their tasks after their time was up - while they did change their answers covertly in order to boost their scores. The first would be a small transgression, while the latter is clearly cheating behaviour and arguably much more severe. All participants were explicitly made aware of the camera presence in study 2; therefore, cheating would most likely have been a choice with the camera taken into consideration.

Practical implications

Our experiments indicated that the physical cues we added to the environment (like litter, cameras, and the presentation thereof) had a substantial influence on behaviour, even when taking gender and personality into account. This is useful for policies and practical applications to deter undesirable behaviour, since elements in the environment can be altered. A disorderly environment caused more littering, and an orderly environment caused people with an external LOC to cheat significantly less. Therefore, it is advisable

to keep environments orderly. Surveillance cameras presented in an authoritative manner were more effective in preventing cheating than a neutral, friendly camera. Furthermore, seeing oneself discourages cheating as well, and therefore my research supports the regularly applied practices of incorporating mirrors in the design of public spaces and office buildings. Elements like cameras, mirrors, and images of eyes can easily be incorporated in an environmental strategy to discourage disorderly behaviour and cheating.

Our research showed that litter in the environment seems to stimulate more littering, thereby confirming the Social Proof principle (Cialdini et al., 1990). This 'copying' of behaviour could also be applied in innovative ways to stimulate advantageous behaviour: for instance, by displaying videos in public spaces, showing someone who throws away litter they find on the ground. The principle of social proof could also be applied using new technologies: for instance, a garbage bin making a sound of trash being thrown into it, whenever someone comes into a close range; or brightly coloured footsteps on the pavement, leading to the garbage bin. These types of cues are commonly referred to as 'nudges', a subtle way of stimulating desirable behaviour (Thaler & Sunstein, 2009).

Although the findings of camera presence attest to the effectiveness of 'authority' framing, findings on more subtle authority cues presented on flyers and cameras placed near trash bins in an intimidating manner suggest that authority cues and intimidating camera presence might backfire. Placing a screen in a salient location on which people can view themselves could be an interesting intervention in an indoor public space, and could even be applied in an interesting and artistic way. Placing mirrors in which people can clearly see their own face (e.g., at eye level) could also be effective in dissuading undesired behaviour - but our studies imply the placement of these mirrors is rather precarious. In order to be effective, mirrors should preferably clearly be in view and reflect the face back to the onlooker.

Our finding that the framing of camera surveillance is relevant for the effectiveness in preventing undesirable behaviour is most likely applicable to any situation. If it is possible to install cameras and a system which frames them in an authoritative way (using audio messages for example), it could prove worthwhile in preventing undesirable behaviour. An authoritative way of framing camera surveillance could also be achieved with signs, as long as these are sufficiently salient. Eye images do seem to be effective in preventing littering, making this an effective and low-cost application to improve public spaces. An authoritative camera could also be applied to settings where people need to work remotely: for instance, if a camera is present, it could be framed in such a way that it can be used by an authoritative person to check up on a worker regularly. However, employing authoritative camera surveillance in this manner might make people feel uncomfortable; and thus affect their work motivation or other processes. The strong presence of a watching authority might even lead to avoidance of being watched, or to recalcitrant behaviour.

Novel trashcan designs should be tested over a longer period of time. Our studies indicated that while eye-catching trashcans do seem to be effective for people who are unfamiliar with the environment and the objects therein, people who are familiar with the surroundings will rather look for the type of trash cans they are used to seeing, and might need some time to adjust to new designs.

Limitations and recommendations

Studying undesirable behaviour in an experimental setting comes with many limitations, which I will elaborate upon below.

Studying undesirable behaviour

Undesirable behaviour is difficult to study in an ethical way. I focused on cheating and littering as a model for undesirable behaviour, because these behaviours are not too severe, have reliable methods of measuring, and have been studied before so we could relate our studies to previous research. To gain a better understanding, other types of undesirable behaviour might be interesting to examine as well. However, studying more severe transgressions than cheating is challenging on ethical grounds, especially when also modifying the environment to stimulate undesirable behaviours. Behaviour like stealing, vandalism, or spraying graffiti would be interesting to study. However, these behaviours are relatively rare, which would mean an experimental study would either take a very long time or would need to be conducted across several locations.

Alternatively, different kinds of relatively mild disorderly behaviour could be interesting to investigate; for instance, loud and obtrusive behaviour in public spaces. Being noisy is generally frowned upon, similar to littering. Being loud could have a comparable effect as disorder in the environment, since it is a type of undesired behaviour which is very noticeable and might trigger other kinds of undesirable behaviour. Noisy people have a direct impact on the people present around them, so this kind of behaviour will add an extra dimension to studying the effects of the environment on behaviour.

Participants

My studies mostly involved residents of the university campus, which is a select part of the general population. The residents of the campus of the University of Twente mainly consist of people from the Netherlands and Germany. A study by Hanel and Vione (2016) across multiple countries indicates that the student population differs significantly from the general public when it comes to attitudes towards dishonest or illegal behaviour; specifically in countries where intellectual autonomy is valued, such as the Netherlands and Germany. According to Stone, Jawahar and Kisamore (2009), attitude towards cheating is a good predictor for actual cheating behaviour. Thus, cheating behaviour could differ between the student population and the general public.

Monetary rewards

Participating in experiments for monetary rewards (used in study 1 & 2) might have a drawback: it could put participants in a certain mind-set where they tend to behave more egotistically, and this might influence the results of experiments on cheating and pro-social behaviour (Vohs, Mead & Goode, 2006; 2008; Mogilner, 2010). Therefore, another way of motivating participants to participate might be more suitable for these kinds of experiments. Research by Lacetera and Macis (2010) indicates that vouchers might be a good alternative, and research by Meng (2019) suggests letting participants pick a gift equal to the value of the rewards will not have the adverse behavioural effects of a monetary reward.

Duration and scope of experiments

For the lab experiments (study 1 & 2), we did not want the experimental conditions to be known or discussed in our research population. To reduce the risk of participants talking among each other about the experimental conditions, I decided to let the experiments run for the amount of time needed to reach the minimum amount of participants we required for all categories in the analysis of our results. This resulted in a rather low but statistically still acceptable sample size. In order to recruit more participants and avoid communication amongst participants, I recommend doing these kinds of studies at multiple locations at once. Similar rooms should be created at these locations, and the same protocol should be used everywhere.

Analysis

My analyses generally involved logistic or multinomial regression, or Chi-square tests. I mainly looked at cheating versus non-cheating or littering versus not littering. To use the amount of cheating in an analysis to gain further insight into cheating behaviour, a two-step analysis would be an option. In this case, one first observes whether or not people cheat; and provided that people cheat, next, the amount of cheating is recorded. However, in order to successfully and reliably perform an analysis like that, I would recommend a much higher number of participants; both to obtain more data on cheating participants and to gain a higher number of participants who cheat more often than once. In my studies, I deemed cheating versus not cheating much more significant than the amount of cheating, since cheating happened so rarely during our experiments. Cheating might have been rare because participating in a lab experiment might trigger social desirability and further reduce the inclination to cheat.

Controlled lab environment

In our first and second studies we did not find any effect of the camera or the monitor on which people could view themselves on littering; the friendly camera nor the camera presented in an authoritative manner in study 2 had any effect either. However, we did find that people littered less in the field study where we used eye images, compared to images of flowers. Since there is absolutely no heightened chance of getting caught

when eye images are present in the environment, one would expect the effect of eye images to be less pronounced than the effect of a camera. Arguably, the effect of camera observation on littering in the lab was negated due to the fact that a lab experiment is a highly controlled context in general (which participants would expect, since they are used to being watched -and tricked - during these types of experiments), whereas a bike parking on campus is not.

Our studies do not allow for firm conclusions on whether pro-social behaviour is influenced by the presence of a camera. This might be due to the fact that the experiments (of study 1 & 2) took place in a lab with an experimenter nearby, which might have negated the effect of the camera presence. Some other studies do seem to find a positive effect of camera presence on pro-social behaviour (Van Rompay et al., 2009), while other studies find a negative effect (Levine, 2000). To enhance ecological validity, we recommend that future research regarding pro-social behaviour and camera presence should take place in a less controlled space, rather than a lab environment.

Explicit cues

The manipulations I used both in the lab and in the field studies were made very explicit. I did this so that the manipulation could not be overlooked by the participants, and to outweigh the sense of observation which is already present in a lab experiment. In our first two studies, presentation and salience proved to be important factors in the effectiveness of camera surveillance, emphasizing the importance of noticeable cameras and a clear motivation for the presence of the cameras. In real-world settings it is arguably more difficult to emphasize the environmental elements which are designed to influence behaviour. However, there are several examples of eye-catching and apparent cameras in real-world practical settings, such as cameras painted neon-yellow against a dark background, large posters or signs which indicate the presence of cameras, or audio messages announcing that the cameras are present, and pointing out the reason why they are there (see Figure 6.1 for example). These examples from real-life situations are comparable to my manipulation in the lab, where I made the camera extra obvious (I used a camera which was rather large and placed at a highly visible location) and pointed it out to the participants. I recommend that cues of social control (i.e., cameras, eye images, mirrors) are made as explicit as realistically possible, in order to reliably test their effects.

Using novel designs

Novel designs of utility objects like trashcans (studies 4 & 5) might most likely not work for people who are familiar with the regular designs of these objects. Arguably, people have a certain image in mind of what a trash can should look like, which hinders identification of novel designs. Arguably, the mirrored trash bins were seen as art objects, and thus not associated with throwing away trash. Similarly to my other studies, context seems to be a very important aspect for studies on the design of trash cans. I recommend testing new designs with people who are less affected by familiarity with the regular designs in

a certain environment. Whether these effects hold up for a longer period of time, should be tested as well. Long-term testing will also compensate for the novelty of the designs: once people are familiar with the new designs, differences in usage between mirrors or camera-equipped designs and control designs might surface.

Figure 6.1: Very explicit camera surveillance

New research directions

The conclusions we can draw from the results of our experiments raise new questions that might inspire future research.

It would be interesting to learn more about the mechanisms behind the effect of camera presence. The personality traits we measured assessing self-representation and self-image did not yield any significant effects. However, both the camera presented in an authoritative manner and the monitor on which participants could view themselves were significantly effective in the prevention of cheating behaviour. Since the camera presented in an authoritative way was highly effective, it could be possible that people are simply dissuaded from cheating because they feel at risk of being reprimanded. However, the fact that the condition where people could view themselves on a monitor was also highly effective in preventing cheating, points to a process involving more implicit self-confrontational processes. Future research could further investigate these processes.

To gain a better understanding in how cues of authority might influence behaviour, one could explore whether a wide range of different kinds of undesirable behaviour might be discouraged or possibly even stimulated by cameras framed authoritatively. Learning more about which types of behaviour are influenced by camera presence could lead to more effective ways of deploying cameras. Additionally, it might be worthwhile to vary the way authority is framed, to examine whether authoritative cues should be more threatening or subtle, depending on the context. The way authority is perceived could also be dependent on related personality factors, such as Social Dominance Orientation (Pratto, Sidanius, Stallworth & Malle, 1994), which is a measure of an individual's preference for hierarchy within any social system and the domination over lower-status groups.

Since the presence of cameras is getting more and more prevalent in this digital age where people are increasingly working from home (which will be encouraged in times of a pandemic like the Corona virus), it would be useful to further explore the effects of camera presence, and how a camera could be utilized to prevent undesired behaviour. The presence of a camera could be framed in either an authoritative way (for instance by an audio message notifying people that an authority is watching them and that they can be reprimanded in case of deviant behaviour) or in a way which would make people more self-conscious (for instance by making them clearly visible on a monitor), depending on the situation. Future research could explore the effectiveness of different ways of presenting a camera across different situations, such as working remotely or taking online tests.

Further research might want to focus on outcome measures or conditions which clearly point at either a rational process, or a more subconscious process through which people are influenced by environmental cues. In our studies I tried to achieve this by varying the risk of getting caught. Another possibility might be to ask participants after the experiment

what motivated them to show a certain behaviour. If the process is subconscious, participants might not have noticed any environmental cues, while their behaviour did change. If they are conscious of the cues, they will probably mention those as a trigger. However, explicitly asking about the environment might risk participants noticing and talking about the environmental factors to future participants. Future research could also employ technology, such as eyetracking to explore which cues are noticed and looked at by participants, and how this influences their behaviour.

In closing

Reducing undesired behaviour is an important goal for policies in many different fields. Behaviour like littering and cheating are a problem in both indoor as outdoor settings. Yet, these behaviours can be influenced by manipulating the physical environment. This dissertation contributes to this societal challenge by unravelling some of the mechanisms underlying undesired behaviour, and the functionality and effectiveness of measures trying to prevent undesired behaviour in the field. The research presented in this dissertation also inspires future research: exploring the mechanisms in which environmental cues can influence behaviour showed that these mechanisms appear to be quite complex, and further research would be valuable to better understand these processes and when they apply.

Camera presence is becoming more and more prevalent in both indoor and outdoor spaces. Yet, in order for camera presence to be effective, framing plays a big role, as the studies in this dissertation indicate. Additionally, there are many alternative ways to dissuade undesired behaviour; these are not dependent on cameras being present, and might even have a more pronounced effect than cameras on different kinds of undesired behaviour, such as littering. Images of eyes or big mirrors might be more conspicuous than a camera, especially in an age when everybody has a camera at their desktop and in their pocket.

The research presented in this dissertation has offered insight into different types of undesired behaviour, the role of personality in parsing social cues in the environment, and the importance of context and framing in trying to effectively employ measures to reduce undesirable behaviour. Additionally, this dissertation invites further research into the mechanisms in which environmental factors influence behaviour.

Chapter 7

Appendices

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Appendix 1

A classification tree with the dependent variable 'cheating overall', and as independent variables the camera conditions (manipulation) 'no camera', 'neutral camera', 'authority watching' and 'self-observation', plus the personality traits 'locus of control' (LOC), 'need for approval' (NA), 'self-monitoring' (SM) and 'social value orientation' (SVO).

Appendix 2

In total, 10 of the 86 participants cheated, and 12 guessed answers after the time they were allowed to work on the puzzles was up. This table illustrates how these numbers are distributed amongst the conditions, and gives an overview of all different types of cheating. As can be derived from the table below, two participants used more than one type of cheating and four participants both cheated and guessed, of which one participant (in the condition without camera) used two methods of cheating *and* guessed during the experiment.

Table S. Number of participants who cheated/guessed in the different conditions.

	No camera present (N=21)	Authority watching (N=20)	Evaluation by others (N=22)	Self- observation (N=23)
Cheating: continuing after time up	6	0	0	0
Cheating: correcting answers from sheet	3	0	3	0
Cheating during experiment (any kind)	7	0	3	0
Guessing after time up	5	1	4	2
Cheating AND/OR guessing during experiment	9	1	6	2

Note: The 'overall' data is not a sum of the frequency of the different types of cheating; a single participant could cheat in multiple different ways during the experiment.
 'Cheating AND/OR guessing overall' is not used in calculations; it is included in this table to illustrate how many participants used cheating and/or guessing during the experiment.

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Well, that's a wrap!

Nederlandse samenvatting

Hoofdstuk 1: Inleiding

Het doel van dit proefschrift is om meer inzicht te krijgen in de psychologische mechanismen die ten grondslag liggen aan ongewenst gedrag. Ongewenst gedrag komt vrij regelmatig voor, en met deze onderzoeken heb ik geprobeerd verschillende methodes te verkennen die zouden kunnen helpen ongewenst gedrag te verminderen. Ik wilde de effecten van verschillende omgevingsfactoren (zoals beveiligingscamera's) experimenteel testen, en onderzoeken hoe dit soort factoren efficiënt kunnen worden toegepast. Ik was met name benieuwd naar hoe de fysieke omgeving de acties van mensen stuurt, in het bijzonder wat ongewenst gedrag betreft. Daarbij wilde ik onderzoeken hoe we de effecten van omgevingsfactoren op ongewenst gedrag kunnen verklaren in termen van de betrokken psychologische processen. Ten slotte wilde ik nagaan in hoeverre verschillende persoonlijkheidsfactoren in deze context een rol spelen.

Om dit te bereiken heb ik onderzocht of wanorde ongewenst gedrag bevordert, en of verschillende methoden van sociale controle (met name, het gevoel bekeken te worden) kunnen helpen om ongewenst gedrag te verminderen of zelfs pro-sociaal gedrag te stimuleren. Daarbij heb ik gekeken naar verschillende persoonlijkheidsfactoren die een rol zouden kunnen spelen in de wijze waarop deze omgevingsfactoren gedrag zouden kunnen beïnvloeden. Dit heb ik gedaan door middel van vier experimentele onderzoeken: twee in een kantooromgeving, en twee in een omgeving buiten in de openbare ruimte op de campus van de Universiteit Twente.

De centrale vraagstelling van mijn proefschrift is: *Hoe beïnvloeden sociale signalen uit de omgeving ongewenst gedrag?* Om dit te beantwoorden werden de volgende deelvragen behandeld:

- In hoeverre beïnvloedt een wanordelijke omgeving ongewenst gedrag?
 - o Op welke manier speelt persoonlijkheid hierin een rol?
- In hoeverre wordt gedrag beïnvloedt door de suggestie van sociale controle?
 - o Op welke manier speelt persoonlijkheid hierin een rol?
- Wat zou de beste manier zijn om deze sociale controle te implementeren?
 - o Hoe kan je sociale controle effectief representeren in een kantooromgeving?
 - o Hoe kan je sociale controle effectief representeren in een buitenomgeving?

Hoofdstuk 2: Studie 1

In mijn eerste onderzoek wilden mijn co-auteurs en ik het effect van wanorde op ongewenst gedrag testen in een kantooromgeving. We hebben ook het effect van sociale controle getest door middel van de aanwezigheid van een camera. We hebben getest of

het achterlaten van rommel al dan niet vaker zou voorkomen in een wanordelijke omgeving, vergeleken met een ordelijke omgeving. Ook onderzochten we of de aanwezigheid van een camera het nadelige effect van een wanordelijke omgeving op gedrag zou remmen. Daarnaast waren we geïnteresseerd of 'cheating' ('vals spelen', of in deze context: 'liegen') vaker zou voorkomen in een wanordelijke dan wel ordelijke kantooromgeving. Om dit te onderzoeken boden we participanten een mogelijkheid om te liegen over de uitkomsten van een test, waardoor ze meer geld konden verdienen. Ten slotte onderzochten we of participanten met een externe 'locus of control' (LOC) al dan niet sterker door de omgeving worden beïnvloed dan participanten met een interne LOC (mensen met een externe LOC denken dat de uitkomst van hun acties voornamelijk bepaald wordt door externe factoren, terwijl mensen met een interne LOC denken dat zij zelf het meeste invloed hebben; Rotter, 1966).

Zoals verwacht ondersteunen onze bevindingen het effect van 'Social Proof' (het vertonen van gedrag wat regulier lijkt in die situatie; Cialdini et al., 1990): mensen lieten meer rommel achter in een wanordelijke, rommelige omgeving. Verder vonden we ook een effect van wanorde op liegen, maar alleen voor individuen die een externe in plaats van een interne locus of control hadden. Daarom lijken dezelfde principes als in de 'Broken Windows Theory' getheoretiseerd (wanorde zorgt ervoor dat verschillen typen ongewenst gedrag worden gestimuleerd; Wilson & Kelling, 1982) ook van toepassing te zijn op een kantooromgeving binnenshuis. Echter, in onze experimentele situatie leek het effect van de omgeving op gedrag niet direct te zijn, maar gemodereerd door persoonlijkheid.

We constateerden geen effecten van cameratoezicht op rommel achterlaten of liegen bij participanten. Onze resultaten geven dus aan dat alleen de aanwezigheid van een camera ongewenst gedrag mogelijk niet voorkomt, althans niet in de specifieke setting die we hebben gebruikt. Uit onze resultaten bleek dat de aanwezigheid van een camera het gevoel van bekeken worden beïnvloedde, maar dit onze respondenten er niet van weerhield om rommel achter te laten of te liegen. Bovendien, onze bevinding dat mensen die logen meer uitgeput waren wanneer er een camera aanwezig was, geeft aan dat de aanwezigheid van een camera wél een effect had, al zij het niet op gedragsniveau.

Om de effecten van camerabewakingen het gevoel bekeken te worden verder te onderzoeken, richtten we ons in onderzoek 2 op de manier waarop de camera wordt gepresenteerd.

Hoofdstuk 3: Studie 2

We wilden verschillende methoden testen om surveillance in een experimentele setting te presenteren, in de verwachting dat de 'framing' (de manier van presenteren) van camerabewaking een verschil zou maken. We onderzochten dit door een drietal camera-situaties te vergelijken met een controle-situatie: een camera die op een gezaghebbende manier werd gepresenteerd, een camera die zo werd voorgesteld dat de deelnemer door

anderen werd geëvalueerd, en een camera met een monitor waar participanten naar zichzelf konden kijken. Al deze situaties werden vergeleken met een situatie zonder camera.

De resultaten van dit onderzoek ondersteunen niet alleen de breed gedragen veronderstelling dat de aanwezigheid van een camera ongewenst gedrag zoals 'cheating' ('valsspelen', of in deze context: 'liegen') kan verminderen, maar ondersteunen ook de notie dat de presentatie van de aanwezigheid van een camera van invloed is op dit ongewenste gedrag, en laten dus zien dat de wijze van presenteren van camerabewaking zeer relevant is. De aanwezigheid van een camera die op een niet-intimiderende en niet-gezaghebbende manier werd gepresenteerd, verminderde het liegen enigszins, maar niet significant. Zoals verwacht nam het liegen echter aanzienlijk af wanneer de camera op een intimiderende, gezaghebbende manier werd gepresenteerd.

Interessant is dat een monitor waarop mensen zichzelf konden zien, net zo effectief was in het voorkomen van liegen als een camera die op een gezaghebbende manier werd gepresenteerd. Aangezien er geen risico was om betrapt te worden en het effect van de camera zelf vermoedelijk te verwaarlozen was in deze situatie, is het preventieve effect van participanten die zichzelf bekijken waarschijnlijk toe te schrijven aan meer impliciete zelf-confronterende processen (zie bijv. Wicklund, 1979).

We constateerden geen significante effecten van cameratoezicht op pro-sociaal gedrag, noch op rommel achterlaten. Ongetwijfeld hadden mensen niet de indruk dat ze zouden worden berispt voor het achterlaten van rommel in dit specifieke type setting (waarin een bepaald niveau van rommeligheid niet ongewoon is). Bovendien is het mogelijk dat pro-sociaal gedrag, zoals het doneren van geld of het helpen van anderen, doorgaans niet vaak zal worden vertoond in gecontroleerde omgevingen zoals de experimentele setting voor deze studie.

Kijkend naar persoonlijkheidskenmerken met behulp van een beslissingsboom-analyse, vonden we een indicatie dat mensen met een interne locus of control (in de overtuiging dat de resultaten van hun acties voornamelijk door henzelf worden bepaald, in tegenstelling tot toeval of geluk) meer geneigd zijn om te liegen wanneer er geen camera aanwezig was, vergeleken met mensen met een externe locus of control. Dit komt overeen met eerder onderzoek, waaruit blijkt dat mensen met een interne locus of control vaker valsspelen op vaardigheidstaken (Whitley, 1998).

In studie 3 wilden we testen of de principes die we in studie 2 hebben onderzocht ook van toepassing zouden zijn op een openbare buitenomgeving, waar mensen anoniem zijn en niet op de hoogte zijn van deelname aan een experiment.

Hoofdstuk 4: Studie 3

Voor deze veldstudie verhuizen we van een binnen- naar een buitenomgeving, waar we onderzochten of enkel de suggestie bekeken te worden voldoende zou zijn om mensen ervan

te weerhouden afval op de grond te gooien. Daartoe gebruikten we afbeeldingen van ogen in plaats van camera's om sociale controle na te bootsen. Zwerfafval is een vorm van ongewenst gedrag dat een veelvoorkomend probleem is in sociale buitenruimtes. Verschillende onderzoeken (bijvoorbeeld Bateson, Nettle & Roberts, 2006) hebben aangetoond dat afbeeldingen van ogen ervoor zorgden dat mensen zich beter gedroegen, vergelijkbaar met het effect van camera's of spiegels. We wilden testen of een suggestie van autoriteit die aan deze afbeeldingen werd toegevoegd (door middel van politiemarkeringen), de effectiviteit van de afbeeldingen van ogen zou veranderen, zoals we dat in de kantoor-omgeving deden door de suggestie van autoriteit toe te voegen door middel van cameratoezicht.

We hebben met name onderzocht of afbeeldingen van ogen mensen ervan zouden weerhouden afval achter te laten, en of verschillende soorten ogen (intense of neutrale blik) en de suggestie van autoriteit (politiemarkering) de effectiviteit van deze afbeeldingen zouden beïnvloeden. Hiervoor werden posters en flyers ontworpen met in totaal zes verschillende combinaties: neutrale ogen, intense ogen en bloemen gecombineerd met politiemarkeringen of neutrale markeringen. Deze flyers plaatsten we op fietsen in een fietsenstalling op de campus van de Universiteit Twente en plaatsten verschillende posters met dezelfde afbeelding rond de fietsenstalling. Vervolgens hebben we geobserveerd of de flyers al dan niet op de grond waren gegooid, en of mensen andere acties met de flyers hadden uitgevoerd (bijvoorbeeld de flyer op een andere fiets plaatsen).

Afval op de grond gooien kwam in dit onderzoek veelvuldig voor: ongeveer 50% van de geobserveerde participanten hadden de flyer op de grond gegooid. Maar interessant is dat we ook ander gedrag hebben geobserveerd: de participanten bevestigden de flyer aan een andere fiets of ander voorwerp, of negeerden de flyer volledig. Aangezien beide gedragingen veel meer inspanning vergen dan alleen het laten vallen van de flyer op de grond, beschouwden we dit als een uniek soort gedrag, dat we als een aparte categorie hebben geanalyseerd. Het was intrigerend om te zien dat het gedrag veel gecompliceerder bleek te zijn dan we aanvankelijk hadden verwacht. De flyer op een ander object achterlaten kwam bijvoorbeeld erg vaak voor. Door wat moeite te doen om een flyer op de fiets van iemand anders achter te laten, konden mensen zich van de flyer ontdoen zonder het op de grond te hoeven gooien (dat laatste wordt over het algemeen als ongewenst gedrag beschouwd). Door de verantwoordelijkheid over te dragen aan een onbekende, slagen mensen er dus in een positief zelfbeeld te behouden door zelf niet degene te zijn die troep op de grond gooit. Dit kan worden beschouwd als een vorm van 'diffusie van verantwoordelijkheid' (Darley & Latané, 1968).

Afbeeldingen van ogen waren effectief in het voorkomen van zwerfafval, maar er was geen significant verschil tussen afbeeldingen van intense en neutrale ogen. Uit een boomanalyse bleek dat neutrale ogen net iets effectiever waren en dat vrouwen meer beïnvloed werden door afbeeldingen van ogen dan mannen. Wanneer mensen langer dan twee seconden naar de flyer keken, leek het waarschijnlijk dat ze de flyer meenamen.

Flyers met politiemarkeringen leken zwerfafval te stimuleren in plaats van te voorkomen. Uit een boomanalyse bleek dat politiemarkeringen over het algemeen meer zwerfvuil veroorzaakten bij de mannelijke participanten. Deze resultaten kunnen erop wijzen dat intimiderende en gezaghebbende signalering een negatieve reactie kan hebben met betrekking tot afval achterlaten. Autoritaire afbeeldingen kunnen recalcitrant gedrag opwekken: mensen 'rebelleren' tegen het systeem en vertonen daarom doelbewust ongewenst gedrag (bijv. Woller et al., 2007).

De afbeeldingen van ogen en de suggestie van autoriteit die in dit experiment werden gebruikt om te testen of ze zwerfvuil tegenhielden, leken andere reacties op te wekken dan de bewakingscamera's en monitor die we gebruikten in onze experimenten in een kantoor-omgeving. In studie 4 bestudeerden we opnieuw het achterlaten van afval, maar deze keer gebruikten we camera's en spiegels om mensen ervan te weerhouden troep op de grond te gooien.

Hoofdstuk 5: Studies 4 & 5

In twee experimenten hebben we getest of de aanwezigheid van een camera of een spiegel zwerfafval zou kunnen tegengaan. We hebben het achterlaten van afval bestudeerd in twee verschillende situaties in de buitenomgeving op de campus van de Universiteit Twente. We wilden testen of de effecten van camera-aanwezigheid en mensen die zichzelf kunnen bekijken, zoals we in de kantoor-omgeving waarnamen, ook in een buitenomgeving van toepassing zouden zijn. Hiervoor gebruikten we prullenbakken die van een camera waren voorzien, of een spiegel die in het ontwerp geïntegreerd was. We vergeleken deze nieuwe prullenbakken met gelijksoortige ontwerpen zonder camera of spiegel, en met een reguliere prullenbak. In studie 4 testten we de nieuwe prullenbakken met nieuwkomers op de campus, en in studie 5 testten we de nieuwe prullenbakken met mensen die bekend zijn met de campus.

De resultaten van ons eerste experiment toonden dat een ontwerp met een camera mensen ervan weerhield om de prullenbak te gebruiken, vergeleken met een vergelijkbaar ontwerp zonder camera. Ons tweede experiment liet geen significant verschil zien tussen het ontwerp met de camera en het vergelijkbare ontwerp zonder camera. In onze beide experimenten constateerden we geen significant effect van het opnemen van een spiegelend oppervlak in het ontwerp van de vuilnisbakken, vergeleken met een vergelijkbaar ontwerp van een glinsterende vuilnisbak zonder het spiegeleffect.

Interessant is dat gecombineerde bevindingen suggereren dat mensen die bekend waren met de campus (experiment 2) vaker de reguliere prullenbakken gebruikten dan de prullenbakken met nieuwe ontwerpen, terwijl mensen die niet bekend waren met de campus (experiment 1) deze 'voorkeur' niet koesterden. Vaste bezoekers waren ongetwijfeld gewend aan het standaard ontwerp en toonden een voorkeur voor de vertrouwde reguliere prullenbakken. De nieuwe ontwerpen waren mogelijk te atypisch,

wat niet alleen identificatie en categorisering van objecten bemoeilijkte, maar mogelijk ook zorgde voor associaties met kunstvoorwerpen, wat het gebruik zou kunnen ontmoedigen (zie Schoormans en Robben, 1996).

Hoofdstuk 6: Algehele conclusies

De resultaten van ons onderzoek leiden tot vier hoofdconclusies:

- We vonden inderdaad bewijs dat wanorde in een kantooromgeving ongewenst gedrag stimuleert, met name het achterlaten van afval. Daarbij stimuleert wanorde ook het valsspelen op een test, maar alleen voor participanten met een externe Locus of Control. Persoonlijkheid blijkt dus een rol te spelen in de manier waarop een wanordelijke omgeving ongewenst gedrag kan beïnvloeden.
- Zowel ons eerste onderzoek als ons tweede onderzoek laten zien dat de wijze van presentatie van de aanwezigheid van een camera van groot belang is voor de effectiviteit van cameratoezicht. Een camera blijkt effectief te zijn om valsspelen te verminderen als deze wordt gepresenteerd alsof het een toezien oog is van een autoriteit die kan straffen, of als de participanten zichzelf zien op een monitor. Een camera gepresenteerd als iemand die vriendelijk toekijkt, blijkt niet effectief. We hebben geen persoonlijkheidsfactoren gevonden die een rol spelen bij de effectiviteit van cameratoezicht, maar het feit dat verschillende manieren van cameratoezicht presenteren effectief waren, kunnen erop wijzen dat er verschillende psychologische mechanismen een rol spelen: één gericht op het voorkomen van gestraft worden, één gericht op zelf-evaluatie.
- Presentatie van sociale controle is erg belangrijk, maar de manier waarop dit effectief kan worden toegepast is sterk afhankelijk van zowel de situationele context als van het beoogde gedrag dat gestimuleerd dan wel ontmoedigd dient te worden. Hoewel uit onze tweede studie blijkt dat de aanwezigheid van een intimiderende camera of de mogelijkheid om zichzelf te observeren valsspelen kan verminderen, hebben deze maatregelen geen preventief effect op het achterlaten van afval en geen stimulerend effect op pro-sociaal gedrag. Bovendien kan de suggestie van autoriteit ook een negatief effect hebben, omdat het recalcitrant gedrag kan oproepen, of kan leiden tot het vermijden van een gebied.
- Ten slotte suggereren onze studies dat psychologische mechanismen die ten grondslag liggen aan relatief veelvoorkomend ongewenst gedrag, zoals het achterlaten van afval, anders lijken te zijn dan voor ernstigere vormen van ongewenst gedrag zoals valsspelen. De bereidheid om vals te spelen lijkt meer te worden beïnvloed door omgevingsmanipulaties die bedoeld zijn om de suggestie van bekeken worden te versterken, en door interacties met persoonlijkheidsfactoren. Hoewel afbeeldingen van ogen enigszins bevorderlijk waren voor het voorkomen van het achterlaten van afval, lijken contextuele factoren zoals de aanwezigheid van een herkenbare vuilnisbak of een flyer die de interesse wekte, relevanter.

Het verminderen van ongewenst gedrag is een belangrijk doel van het beleid op veel verschillende terreinen. Het onderzoek dat in dit proefschrift wordt gepresenteerd heeft inzicht geboden in verschillende soorten ongewenst gedrag, heeft de mechanismen die ten grondslag liggen aan ongewenst gedrag getracht te ontrafelen, heeft de rol van persoonlijkheid in het interpreteren van sociale signalen vanuit de omgeving geëxploreerd, en heeft het belang geduid van context en 'framing' bij het effectief toepassen van maatregelen om ongewenst gedrag te verminderen. We hopen dat dit proefschrift ook toekomstig onderzoek zal inspireren. Ons onderzoek naar de psychologische mechanismen waarmee omgevingsfactoren het gedrag kunnen beïnvloeden toont aan dat deze mechanismen vrij complex blijken te zijn. Verder onderzoek zou waardevol zijn om deze processen beter te begrijpen, en om te testen wanneer welke omgevingsfactoren effectief zijn om bepaalde soorten gedrag te beïnvloeden.