Master thesis Marketing Communication
Faculty of Behavioural Science

A 360-DEGREE VIEW ON FACE RECOGNITION CAMERA SURVEILLANCE

What are the effects of the messaging strategy and environment type on the effectiveness of face recognition?

Roy Strikker
s1398881
Supervisors: Thomas van Rompay & Peter de Vries
University of Twente

Abstract

This current study examines the effects of the messaging strategy (aggressive vs humour vs no-information) and environment type (high-threat vs low-threat) on the effectiveness of face recognition camera surveillance. The effectiveness is measured by safety feeling, feeling of being at risk, privacy perception, general attitude, intention of the policy makers and interpretation of an ambiguous situation. After conducting two pre-tests and a focus group meeting to validate the stimulus material, the authors examined 108 participants in a 2 (environment type) x 3 (messaging strategy) experiment. Respondents were randomly assigned to one of the six conditions and filled in a questionnaire. The results showed a significant main effect of messaging strategy and significant effects on privacy perception and general attitude. This means that people evaluate the situation with no information about face recognition surveillance more positive on privacy perception and general attitude than a situation where they were faced with a humorous strategy or aggressive strategy. Besides, the results demonstrated a significant main effect of environment type and significant effects on the feeling of being at risk and the perceived intention of the controllers. This means that the perceived intention of the policy makers was more positive at a high-threat environment than at a low-threat environment. Furthermore, people felt more at risk at the high-threat environment than at the low-threat environment. Additionally, the results showed that there was an interaction effect on privacy perception, which means that an aggressive messaging strategy caused a more positive privacy perception in the environment with a high-threat in contrast to an aggressive strategy in the environment with a low-threat. Also, there was a marginal interaction effect on safety feeling, which means that a humorous messaging strategy in the environment with a high threat, caused a more negative safety feeling, in contrast to a humorous strategy in the environment with a low-threat. The findings are not directly in line with previous literature, which means that some discussion points came up, leading to suggestions for future research. One of the recommendations is to make use of humorous information about face recognition cameras in less threatening situations where cameras are not expected, because the respondents felt safer when they were confronted with humorous information at the situation with a low threat, in contrast to humorous information at the situation where the threat was high. Further recommendations will be discussed.

1. Introduction

Originally, the implementation of camera surveillance technology started in London and Liverpool in the 1960s. However, the expansion of the technology was limited due to the high cost of cabling the cameras (Saulnier & Thompson, 2016; Williams, 2003). In the late 1990s to early 2000s, there has been a sustained growth in the implementation of CCTV technology to prevent crime in public spaces. Moreover, recent events, including terrorist attacks, have resulted in an increasing demand for security in society. The terrorist attacks on the United States of America on 11 September 2001 has even been described as precipitating a program of 'globalized surveillance' (Mann & Smith, 2017). The British Security Industry Authority (BSIA) estimated that there are up to 5.9 million surveillance cameras in the country, or one for every 11 citizens in the UK (Barrett, 2013). Therefore, the level of social control expanded by the growing use for surveillance activities in many environments. For example, highway interchanges, pedestrian crossings, traffic-signal locations, city centres, rail stations and airports (Davies & Velastin, 2005). However, empirical research on the effectiveness of CCTV technology on reducing crime and disorder is mixed. The findings of Welsh and Farrington (2008) indicate that surveillance cameras did not have significant desirable effects in public settings. Only in car parks there was a significant reduction in crime rates. In line with this, CCTV was reported to be more effective at reducing property crime than violent crime (Welsh & Farrington, 2009).

This raises interest in automated surveillance systems that are able to analyse and understand human acts and even performing human identification in order to identify suspects. These automated facial recognition technologies are an extension of facial 'profiling' or 'mapping', which involves the comparison between facial features or the similarities and differences in facial characteristics. This has been used in criminal justice systems around the world since the 19th century, and continues to be used today. (Mann & Smith, 2017). By making use of facial recognition camera surveillance, the aim is to prevent criminal offences and provide an environment in which people feel safe. However, several studies in the past came to different conclusions and it is not proven that crime is declining or that people really feel safer due to the presence of camera surveillance. Besides, it is remarkable that these studies are very limited because they only focus on the crime-reducing effect of camera surveillance (Armitage, 2002) and ignore many other factors that play a role (Piza, Caplan & Kennedy, 2014). For example, the signage of the cameras has become a serious issue and could be a determining factor for the effectiveness of camera surveillance (Cole, 2002). These signs explain the purpose of the camera surveillance, but the language used on these signs can be different. For example, a sign might read: 'Taping now! Your face is monitored by face recognition cameras!!' or it might say: 'We use face recognition cameras to protect your safety here.'

Besides, the presence or absence of threat in an environment is an essential factor. It will colour the interpretation of surveillance, the motives and perceived intention of the policy makers. Cameras are likely to be viewed as useful and appropriate if the threat is high, in contrast to an environment where the threat is low.

For this reason, this study will focus on this aspect and examine what emotional experience people have with face recognition surveillance, and which messaging strategy for camera usage should be employed in different types of environments (low threat vs. high threat). In order to evaluate the impact that face recognition camera surveillance is having, or potentially could have, an experimental design was prepared which focused on the safety feeling of the citizens, feeling of being at risk, privacy perception, intention of the policy

makers, the general attitude and the interpretation of an ambiguous situation. By focusing on these topics, the main question in this study is: *What are the effects of the messaging strategy and environment type on the effectiveness of face recognition?*'

2.2 Effects of camera surveillance

Camera surveillance is like a double-edged sword. Numerous studies showed concerns on potential infringement of privacy by camera surveillance (Goold, 2002; Lippert, 2009; Möllers & Hälterlein, 2013; Royakkers, Timmer, Kool & Van Est, 2018). However, studies also suggested that the public generally supports the installation of cameras and believe that it is effective in detecting and deterring crime and fear of crime (Ditton, 2000; Spriggs, Argomaniz, Gill & Bryan, 2005; Phillips, 1999). On the other hand, further studies on the effects of camera surveillance on safety feeling may imply less supportive attitudes. When feelings of safety are compared over time, there is no improvement after installation of camera surveillance (Ditton, 2000; Taylor, 2012). However, it is evident that camera surveillance affects behaviour. This is also demonstrated by Latané (1981), who suggested with the social impact theory, that "any of the great variety of changes in physiological states and subjective feelings, motives and emotions, cognitions and beliefs, values and behavior, that occur in an individual, human, or animal, as a result of the real, implied or imagined presence or actions of other individuals" (Latané, 1981, p. 343). So the imagined presence or actions of other individuals (i.e., surveillance cameras) has an influence on the subjective feelings, emotions and impressions. Furthermore, it does not make a difference whether the presence of others is imagined or real. Since the usage of camera surveillance increases the chance of getting caught, this should help to prevent undesired behaviour. This is also proposed by Cohen and Felson (1979) in the Routine Activity Theory. They say that there must be a motivated offender, a suitable target and the absence of a capable guardian. CCTV cameras, as a capable guardian, may help to reduce crime. In line with this, the Social Control Theory (Hirschi, 2002), suggests that this capable guardian has to be identified as an authority figure who has the ability to threaten with sanctions and punishment if the individual disobeys. Previous studies have shown that this threat of punishment is a key component in deterring criminal behaviour (e.g., Akers, 1990; Braga and Weisburd, 2012). So monitoring crimes with surveillance cameras by an authority could fulfil the role of a guardian, since it increases the risk of detection and punishment. However, cameras do not automatically trigger socially-desirable behaviour. The signage and messaging strategy could also be a determining factor on the effectiveness of surveillance cameras (Van Rompay, Vonk & Fransen, 2009; Huttinga, 2011; Ten Harmsen 2015).

2.3 The signage and messaging strategy

Signages in different contexts are used to signal a camera's presence in order to increase its deterrent effects. By law, the police and municipality must inform the citizens about the usage of face recognition cameras. Goold (2002) addresses these concerns of camera surveillance and privacy and he argues that any camera in public environments should be accompanied by signage asserting that the environment is being controlled. Besides, signages helped to reduce crimes and had a positive effect on safety feeling (Miziani, Jabbari & Karimiyan, 2015). For this research, three different messaging strategies for these signages were used: A humorous approach, an aggressive approach and no information about face recognition surveillance. Making use of different humorous or aggressive approaches to win people's attention is not new and is researched for decades. However, Eisend (2009)

concluded that it is better to investigate in what situation a messaging strategy is effective, and not whether a humorous or aggressive strategy is in general effective. As mentioned before, threat of punishment is a key component in deterring criminal behaviour. It becomes "important to know whether people realise they are being monitored; whether they feel they (as opposed to others) are being watched; who they think might be watching them (ingroup members/outgroup members?); what kinds of behaviours are acceptable to or punishable by whoever is watching and so on" (Levine, 2000, p. 6). Thus, it is of great importance that the presence of cameras is communicated in such manner, that the individuals have the feeling that criminal behaviour can be punished by an authority figure. Based on this, the police would benefit more from an aggressive, authoritarian approach. Furthermore, Burgoon, Jones and Stewart (1975) demonstrated that highly credible sources benefited more from an unfriendly, hard and highly intense language. Besides, messages became less effective and less credible when messages were of low intensity. This theory is based on Burgoon's self-developed theory from 1975, the Language Expectancy Theory (LET). It assumes that "language is a rule-governed system and that people develop macro-sociological expectations and preferences concerning the language or message strategies employed by others in persuasive attempts" (Burgoon, Denning & Roberts, p. 120). Moreover, the theory states that unexpected language usage and violation of linguistic norms can influence the behaviour of the recipient, which can have either a positive or negative effect on the persuasiveness of the source (Burgoon et al., 1975). In summary, based on Hirschi (2002), Akers (1990), Braga and Weisburd (2012) Levine (2000) and Burgoon et al. (1975), it is expected that the police will, according to the social expectations, benefit more from an aggressive approach. This leads to the following hypothesis:

H1: An aggressive messaging strategy for the usage of face recognition cameras will cause more positive effects for face recognition cameras, in contrast to a humorous messaging strategy or no information about face recognition surveillance

2.4 Different environments

Face recognition cameras are already integrated in law enforcement, but it is also spreading deeply into the private sector. According to Introna and Nissenbaum (2010), the use of face recognition technology is highly specific to the particular environment and it performs the best when it is developed for a specific context. For example, the general attitude towards face recognition cameras is more positive in 'functional places' such as car parks and pedestrian subways than in residential areas and public squares (Vitalis, 1998; Holscher, 2003). According to Klauser (2007), "public acceptance of video-surveillance strongly depends on whether people can imagine any direct personal benefits from the cameras or not" (Klauser, 2007, p. 342). It was also examined by Introna and Nissenbaum (2010), that the public tends to accept that it has to experience small inconveniences so that criminals can be arrested, but the use of cameras must be justified and proportionate to its function. This was also shown by Taylor (2010), who demonstrated the value of privacy as perceived by pupils from an English school. When the cameras were used to counteract criminal behaviour and vandalism, it appeared that the reduced privacy was less important. However, when the cameras were placed in an environment where people have heightened expectations of privacy, such as changing rooms or toilet areas, it should not be used. In line with this, Strikker (2016) concluded that the Dutch citizens had a more positive emotional experience with face recognition cameras in a high threat environment, in contrast to a low-

threat environment. Also, it was concluded that the Dutch citizens felt safer after they came into contact with a face recognition sign in a high threat environment, in contrast to a low threat environment. This shows that placement of camera surveillance into an area could potentially influence the perception of the environment as a site of potential risk. The environment was apparently less safe than they initially thought: 'Why am I under surveillance while this environment is not threatening?'

Camera surveillance not only changes the perception of the environment, but it also influences normative behaviour. This is shown by Aarts and Dijksterhuis (2003), who demonstrated that the environment activates mental representations of appropriate behaviour in that particular situation. Furthermore, Kay, Wheeler, Bargh and Rossa (2004) showed that prior exposure to pictures of business objects, such as briefcases and fountain pens, lead to more competitive behavioural intention than exposure to pictures of neutral objects. This led to a more competitive-relevant word completion and a more competitive interpretation of an ambiguous social situation. In addition, placing cameras in a particular environment could also lead to prosocial behaviour (Van Rompay, Vonk & Fransen, 2009). They showed that participants in the camera condition offered more help in contrast to a situation with no security camera's involved. Actually, camera placement influences an individual's perception about crime and disorder in a particular context. According to van Rompay, de Vries & Damink (2015), respondents framed an ambiguous interaction in more positive terms compared to those in the no-camera condition. It showed that respondents in the camera condition framed an ambiguous scene in more positive terms (e.g., "A man and a woman have a rendezvous in a stable on a foggy evening") compared to the control condition with no camera (e.g., "A young woman is being chased by a perpetrator"). This indicates that effects of camera presence extend beyond mere perceptions and may also impact social evaluations and related behaviours. However, it is unexamined what will happen in situations wherein the rationale for camera presence is less obvious. According to van Rompay et al. (2015), contextual variables and framing of camera presence can make the difference between a suspicious, anti-social civilian and a citizen feeling safe, cared for and open towards others. This leads to the following hypothesis:

H2: A high-threat environment for the usage of face recognition cameras will cause more positive effects for face recognition cameras, in contrast to a low-threat environment to make use of face recognition cameras

2.5 Interaction between messaging strategy and environment

This current study focuses on the effects of contextual influences relating to the environment of camera usage and the messaging strategy. Here, the aim is to find out in which situation a friendly strategy with humour is most effective or an intimidating strategy. As mentioned before, the police and municipalities would benefit more from an intimidating approach. However, numerous studies have demonstrated that individuals are more open to influence to desirable behaviour and pro-social behaviour from in-group members than similar influence attempts from out-group members (Abrams, Wetherell, Cochrane, Hogg & Turner, 1990; McGarty, Turner, Hogg, David & Wetherell, 1992). Expanding on this reasoning, O'Donnell, Jetten and Ryan (2010) argued that "whether surveillance is perceived as an invasion of privacy depends on the perceived social relationship with the source of the surveillance—surveillance is perceived as more acceptable when it originates from a group with which one identifies or shares an identity" (O'Donnell, Jetten & Ryan, 2010, p. 135).

One way to increase the perception of a shared identity is the usage of humour and it is widely recognised as an effective strategy to build group cohesiveness (Graham, Papa & Brooks, 1992). However, it also manages the inevitable tensions that arise in interactions between different groups in society and it may be used by superiors to alleviate the impact of authoritative behaviour (Duszak, 2002). By releasing the tension through humour, the communicator creates a more equal relationship with the audience to ensure mutual identification (Meyer, 2000). As mentioned by O'Donnell et al. (2010), sharing a sense of identity affects the degree to which surveillance is seen as an invasion of privacy, and they say that this "is particularly likely to be the case when the reason for introducing surveillance is open to multiple interpretations" (O'Donnell, Jetten & Ryan, 2010, p. 136). So it is expected that a shared identity has a larger effect in the low-threat environment, because the surveillance is more open to multiple interpretations here. For example, when camera surveillance is used in a low-threat location such as a park or a library, this may be interpreted either as protecting the safety of the individuals or as motivated by distrust. Here, the messaging strategy could be a determining factor. However, in a high-threat environment, the police is more likely to be perceived as an in-group member, promoting the safety in the area. The messaging strategy would not change this. For this reason, the following hypotheses about the interaction effect of messaging strategy with type of environment can be proposed:

H3a: An aggressive messaging strategy causes more positive effects for face recognition cameras in a high-threat environment, in contrast to a low-threat environment

H3b: A humorous messaging strategy causes more positive effects for face recognition cameras in a low-threat environment, in contrast to an aggressive messaging strategy.

Hypotheses
H1: An aggressive messaging strategy for the usage of face recognition cameras will cause more positive effects for face recognition cameras, in contrast to a humorous messaging strategy or no information about face recognition surveillance
H2: A high-threat environment for the usage of face recognition cameras will cause more positive effects for face recognition cameras, in contrast to a low-threat environment to make use of face recognition cameras
H3a: An aggressive messaging strategy causes more positive effects for face recognition cameras in a high-threat environment, in contrast to a low-threat environment
H3b: A humorous messaging strategy causes more positive effects for face recognition cameras in a low-threat environment, in contrast to an aggressive messaging strategy.

Figure 1: The hypotheses

3. Methodology

Two different pretests were completed to develop the stimulus materials.

3.1 Pretest 1

At first, ten potential locations for face recognition camera surveillance have been chosen. The locations that were chosen consist of: shopping mall, Schiphol airport, bank, train station, supermarket, library, hospital, city hall, school and a parking area. To confirm which locations are appropriate, with a high-threat and inappropriate, with a low-threat, a preliminary research is completed among 13 respondents. An online questionnaire was sent to these respondents and consisted of the same four questions which could be answered on the basis of a 5-point Likert scale with anchors set as 1 (strongly disagree) and 5 (strongly agree):

1. I think this a reasonable location for facial recognition camera surveillance
2. I see this as a shocking location for facial recognition camera surveillance
3. I believe that this is an appropriate location for facial recognition camera surveillance
4. I will be annoyed if facial recognition camera surveillance takes place at this location

The results of the research instrument, that can be seen in figure 2, show that the respondents thought that the library was the most inappropriate location. The bank, Schiphol airport and train station were all seen as appropriate locations and differed not much from each other. However, the researcher interpreted that Schiphol was the best choice from these three locations, because it was the best location to prepare feasible stimulus materials.

	Reasonable location		Shocking location		Appropriate location		Annoying location	
	M	SD	M	SD	M	SD	M	SD
Shopping centre	3.23	1.24	2.77	1.23	3.00	1.23	2.69	1.32
Schiphol	4.23	1.30	1.69	1.11	3.92	1.19	1.62	.96
Bank	4.08	.64	2.00	.91	3.69	.95	2.23	1.01
Train Station	4.62	.65	1.62	.96	4.08	1.04	1.92	1.32
Grocery store	2.46	1.13	3.38	.96	2.46	.97	3.23	1.17
Library	1.62	.87	4.31	.48	1.77	.83	4.15	.80
Hospital	2.62	1.19	3.46	1.05	2.69	1.11	3.31	1.03
City hall	2.92	1.19	3.00	1.08	2.92	1.04	3.15	1.07
School	2.31	1.11	4.00	.82	2.46	1.20	3.62	1.12
Car park	3.08	1.26	3.15	1.14	3.08	1.26	3.23	1.09

Figure 2: Results of pretest 1

3.2 Pretest 2

The second pretest tested which type of framing in a notice of the usage of face recognition cameras were seen as moderate or extreme. 10 respondents completed an online questionnaire and were asked to express their feelings about these sentences. In total, 8 different sentences were employed and could be answered on the basis of a 5-point Likert scale with anchors set as 1 (strongly moderate) and 5 (strongly extreme):

1. The face recognition camera system is connecting with the security headquarter
2. Beware, this environment is being guarded by face recognition cameras!
3. We use face recognition cameras to protect your safety here
4. Taping now! Your face is monitored by face recognition cameras!!
5. The face recognition camera system is being operated now
6. Security notice, you are under face recognition camera surveillance
7. Please smile, face recognition cameras are running!
8. Warning, face recognition cameras in operation

The results, that can be seen in figure 3, show that the respondents thought that *"Taping now! Your face is monitored by face recognition cameras!!"* (M = 4.09, SD = .83) is seen as the most extreme sentence and *"Please smile, face recognition cameras are running!"* (M = 2.18, SD = 1.47) is seen as the most moderate sentence. For this reason, these are the two different messaging strategies that will be used for the main study. In the rest of the study, the moderate sentence will be labelled the 'humorous condition' and the extreme sentence will be labelled the 'aggressive condition'.

Type of framing	M	SD
The face recognition camera system is connecting with the security headquarter	2.55	1.04
Beware, this environment is being guarded by face recognition cameras!	3.45	.69
We use face recognition cameras to protect your safety here	2.36	1.12
Taping now! Your face is monitored by face recognition cameras!!	4.09	.83
The face recognition camera system is being operated now	2.73	.91
Security notice, you are under face recognition camera surveillance	2.64	1.03
Please smile, face recognition cameras are running!	2.18	1.47
Warning, face recognition cameras in operation	3.36	.67

Figure 3: Results of pretest 2

3.3 Stimulus material

Based on these results, the six video's ranging in terms of signage and environment type were produced. The stimulus material that will be used are 6 different short films showed via Virtual Reality. The reason this study makes use of Virtual Reality is because it is actively being used in a number of industries to support decision making and enable innovation. Besides, an essential aspect of Virtual Reality is the high level of interaction between the user and the instrument, as well as the enriched experience for the user (Kim, Park & Lee, 2014). A virtual reality experience convinces users that they feel physically located within the virtual world or feel a sense of presence. The use of VR not only provides a more realistic real-time experience, but also increases the ecological validity of the experiment by exposing respondents to a stimulus closer to reality than that obtained using a two-dimensional screen (Kim, Park, & Lee, 2014; Witmer & Singer, 1998; Bowman & McMahan, 2007).

The films were recorded with the Samsung Gear 360. This is a 360° spherical camera with 15 megapixels and Full HD option. The camera has one lens at the front and one lens at the back and the frames can be stitched together. The Samsung Gear VR-glasses were used to create a virtual reality environment in combination with a Samsung Galaxy S6 with a 5.1' inch screen with 2560 x 1440 pixels. To implement the signages into the different films, the researcher made use of Adobe After Effects. This software program provides a plugin called 'Mocha' and can be used for planar tracking. This made it possible to remove the old object and insert the images of the signage. Appendix 3 shows screenshots of the short virtual reality film from two different conditions: Schiphol with a humorous sign and library with an aggressive warning sign.

3.4 Focus group meeting

To decide on the overall design, a focus group meeting was conducted. The signs consist of different tested elements: The colour of the title, background colour and the animation of a camera and a face being scanned by the camera. The logo of the police is kept consistent during the focus group, because it is the national logo of the Dutch police department and the text of the messaging strategy is also kept in the colour black because of the white background. A visualisation of the different signages can be seen in figure 4 and figure 5.

Figure 4: Signage for the humour conditions

Figure 5: Signage for the warning conditions

3.5 Participants

There were 108 subjects participating in this study (59 males, 49 females) and the participants were randomly assigned to one of the six conditions. Sample characteristics are reported in figure 6.

Demographics		**N**	**%**
Gender			
	Male	59	54.6%
	Female	49	45.4%
Age:			
	18-30	51	47.2%
	31-45	26	24.1%
	46-65	25	23.1%
	66-85	6	5.6%

Figure 6: Sample characteristics

3.7 Procedure

The questionnaire was prepared by making use of the survey tool Qualtrics. The participants were received in different locations in the Netherlands such as in neighbourhoods in the city of Almelo, Enschede, Twello and Deventer. It was taken care of that the environment was quiet and peaceful so that the respondents could focus on the VR film and questionnaire. At first, the respondents were asked to read and sign a declaration of consent before the experiment started. After this declaration, a short introduction was given about the VR film and the researcher assisted the respondents with the VR-glasses. The films in virtual reality were shown with the Samsung Gear VR and Samsung galaxy S6. Following, the respondents entered one of the six short films. After the film, the participants were asked to fill in the survey about the five different constructs that were to be measured.

3.9 Measures

The measurement instrument consists of five different constructs. The constructs can be seen in figure 7 and the measurement instrument can be seen in Appendix 4.
The first construct is safety perception. This is defined by Van der Veen (2006) as the peoples' perception of safety in a particular environment, that can be affected by direct or potential threat from persons. Safety perception was operationalized by using items from Honess and Charman (1992) and Integrale Veiligheidsmonitor (2014), measured on a 5-point likert scale. This scale turned out to be unreliable ($\alpha = .52$) and consisted of 6 items. The most representative item for both factors will be used in this study. The most representative item of the first factor consists of 'I feel safe in this situation', and the second item consists of 'I feel that I am in danger in this situation'.

The third construct is the general attitude. It was defined by Fishbein (1967) as 'a learned predisposition of human beings' and based on this predisposition 'an individual would respond to an object (or an idea) or a number of things (or opinions).' Besides, Kotler (2000) stated that 'an attitude is a person's enduring favourable or unfavourable

evaluations, emotional feelings, and action tendencies towards some object or idea'. To measure the general attitude we used a study from Honess and Charman (1992), measured on a 5-point Likert scale. Examples of items were 'I think face recognition cameras help to protect society' and 'in general I am against the use of face recognition camera surveillance'. In total, ten items were used to measure general attitude (α= .85).

Intention of the policy makers was the fourth construct. This is the extent to which individuals assume that the authorities and operators do not abuse the surveillance system for personal or collective interests such as bribing, entertainment, court cases, etc (Fay, 1998). This construct was also based on Hones and Charman (1992), measured on a 5-point Likert scale. Examples of items were 'I think the goal is clear for using face recognition cameras in this situation' and 'people are unnecessarily harassed with the use of face recognition cameras in this situation'. In total, five items were used to measure this construct (α= .85).

The fifth construct was privacy perception. This is defined as the subjective probability with which individuals believe that the collection and subsequent access, use, and disclosure of their private and personal information is consistent with their expectations (Chellappa, 2008). Privacy perception was operationalized by using existing items from Honess and Charman (1992) and Kroener (2016), measured on a 5-point Likert scale. Examples of items were 'I think privacy is being violated in this situation' and 'I would feel being watched in this situation'. In total, five items were used to measure this construct (α= .81)

The last construct is the interpretation of an ambiguous situation. This effect has to do with interpretation bias, which refers to the tendency for anxious individuals to interpret ambiguous stimuli in a threat-related way (Chorpita, Albano & Barlow, 1996; Hadwin, Frost, French & Richards, 1997). This is assessed by asking the participants what they think is happening on a picture that could be interpreted in a threatening or non-threatening way (see figure 8). Cohen's kappa was run to determine if there was an agreement between two raters' judgement on whether 20 individuals interpreted the ambiguous situation as negative or positive. This was based on a 5-point Likert scale with anchors set as 1 (very negative) and 5 (very positive). The Cohen's Kappa was 0.60, which is perceived as a moderate strength of agreement (Altman, 1999; Landis & Koch, 1977). Examples of different interpretations are 'frightening situation' and 'alley with a woman and a shadow on the wall'.

	N-items	**Cronbach's alpha**
Safety feeling	1	
Feeling of being at risk	1	
Privacy perception	5	.81
Intention	5	.85
General attitude	10	.85

Figure 7: The used constructs

Figure 8: The used image of an ambiguous situation

4. Results

Below, the results of the (environment type) x 3 (messaging strategy) experiment will be discussed. The independent variable 'type of environment' consisted of two variations: High threat versus low threat and the second independent variable consisted of three variations: A humorous sign, an aggressive warning sign and no information. The dependent variables consisted of safety feeling, feeling of being at risk, privacy perception, general attitude, intention of the policy makers and interpretation of an ambiguous situation. Figure 11 and figure 12 present a summary of the main and interaction effects.

4.1 Main effect of messaging strategy

Regarding the messaging strategy, A MANOVA revealed that there was a significant main effect of messaging strategy: $F(12,194) = 4.10$, $p = .000$, Wilks' Lambda = .64, showing that there is a statistically significant difference between the effects of face recognition cameras and some or all of the conditions (humour, aggressive and no-information) (Figure 11). The MANOVA revealed that the effect of the messaging strategy on privacy perception is significant ($F(2,102)= 17.45$, $p = .000$, showing that no information ($M = 3.80$, $SD = 0.10$) scored significant higher on privacy perception than aggressive information ($M = 3.14$, $SD = 0.10$) and humorous information ($M = 3.19$, $SD = 0.10$). Besides, MANOVA showed a significant effect of messaging strategy on the general attitude: ($F(2,102)= 5.42$, $p = .006$), which means that the 'no information' condition ($M = 3.80$), $SD = 0.08$) scored significantly higher on general attitude than aggressive information ($M = 3.49$,$SD = 0.08$) and humorous information ($M = 3.47$, $SD = 0.08$). However, MANOVA showed that there were no significant effects of the messaging strategy on four of the six variables: Safety feeling ($F(2,102)= 1.87$, $p =$ n.s.), feeling of being at risk ($F(2,102)= .07$, $p =$ n.s.), intention of the policy makers ($F(2,102)= 1.00$, $p =$ n.s.) and interpretation of the ambiguous situation ($F(2,102)= .78$, $p =$ n.s.) (Figure 12).

4.2 Main effect of environment

Regarding the type of environment, a MANOVA revealed that there was a significant main effect of environment on the six dependent variables together: $F(6,97) = 5.18$, $p = .001$, Wilks' Lambda = .76, showing that there are statistically significant differences between the two conditions (high-threat and low-threat) (Figure 11). MANOVA showed that the effect of

environment on feeling of being at risk is significant: (F(1,102)= 8.74, p = .004, which shows that the respondents felt more at risk at Schiphol (M = 2.24, SD = 0.09) than at the library (M = 1.87, SD = 0.09). Besides, there was a significant main effect of environment on the perceived intention of the policy makers (F(1, 102)= 16,21, p= .000. This suggests that the intention of camera usage was more clear at Schiphol (M = 3.78, SD = 0.86) than at the library (M = 3.29, SD = 0.86). However, MANOVA showed that there were no significant effects of the different environment on four of the six dependent variables: Safety feeling (F(1,102)= 2.27, p = n.s.), privacy perception (F(1,102)= .33, p = n.s.), general attitude (F(1,102)= 2.29, p = n.s.) and interpretation of the ambiguous situation (F(1,102)= .50, p = n.s.) (Figure 12).

4.3 Interaction effect of environment and messaging strategy

Regarding the interaction effect of environment and messaging strategy, a MANOVA revealed that there was a significant interaction effect of environment with messaging strategy: F(12,194) = 2.55, p = .004, Wilks' Lambda = .75, showing that there is a significant interaction effect of environment and messaging strategy (Figure 11). The interaction between environment and messaging strategy for the dependent variable privacy perception reached significance (F(2,102)= 3.76, p = .027). Planned comparisons showed that in the humorous information condition, participants did not respond to differences in environment ($M_{schiphol}$ = 3.09, SD = 0.14 versus $M_{library}$ = 3.29, SD = 0.14; F < 1). This also applied to the no information condition ($M_{schiphol}$ = 3.83, SD = 0.14 versus $M_{library}$ = 3.94, SD = 0.14; F < 1), whereas in the aggressive information condition, the difference between the different environments was significant ($M_{schiphol}$ = 3.40, SD = 0.14 versus $M_{library}$ = 2.89, SD = 0.14; F (1, 102) = 6.54, p = .012. Only for the aggressive strategy the environment had an impact. The aggressive strategy and Schiphol results in a significantly higher score on privacy perception than an aggressive strategy at the library. A visualisation can be seen in figure 9.

There was also a marginal interaction effect on safety feeling (F(2,102)= 2.77, p = .067). Planned comparisons showed that in the aggressive information condition, participants did not respond to differences in environment ($M_{schiphol}$ = 3.78, SD = 0.17 versus $M_{library}$ = 3.61, SD = 0.17; F < 1). This also applied to the no information condition ($M_{schiphol}$ = 3.89, SD = 0.17 versus $M_{library}$ = 4.06, SD = 0.17; F < 1), whereas in the humorous information condition, the difference between the different environments was significant ($M_{schiphol}$ = 3.39, SD = 0.17 versus $M_{library}$ = 4.00, SD = 0.17; F (1, 102) = 6.80, p = .010. Only for the humorous strategy the environment had an impact. The humorous strategy at Schiphol results in a significantly lower score on safety feeling than a humorous strategy at the library. A visualisation can be seen in figure 10. However, it was revealed that there were no significant interaction effects on: feeling of being at risk (F(2,102)= .81, p = n.s.), general attitude (F(2,102)= 1.05, p = n.s.), intention of the policy makers (F(2,102)= 2.19, p = n.s.) and interpretation of an ambiguous situation (F(2,102)= 2.26, p = n.s.) (Figure 12).

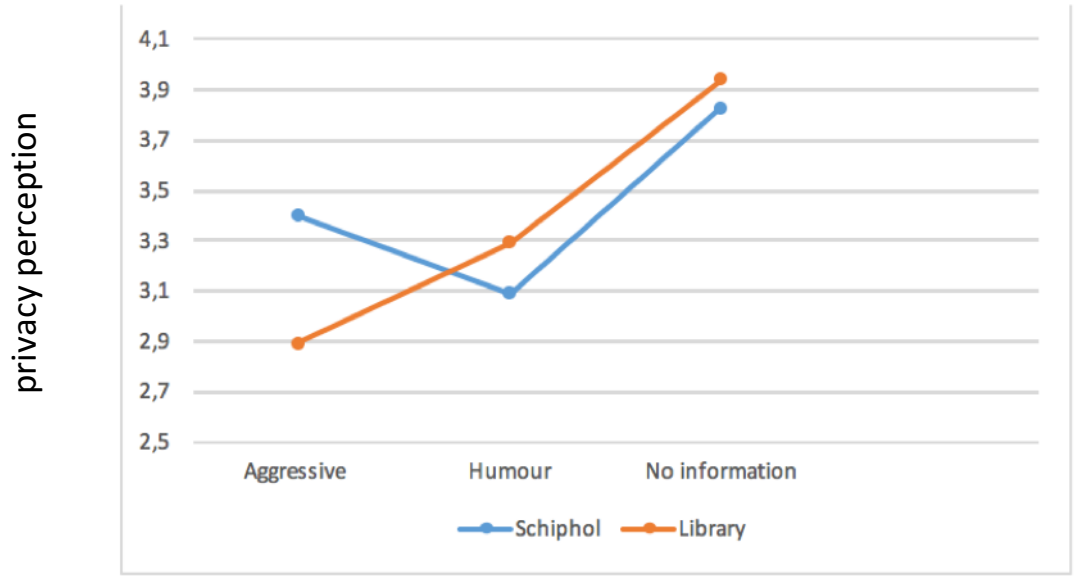

Figure 9: Visualisation of the interaction effect of messaging strategy and environment on privacy perception

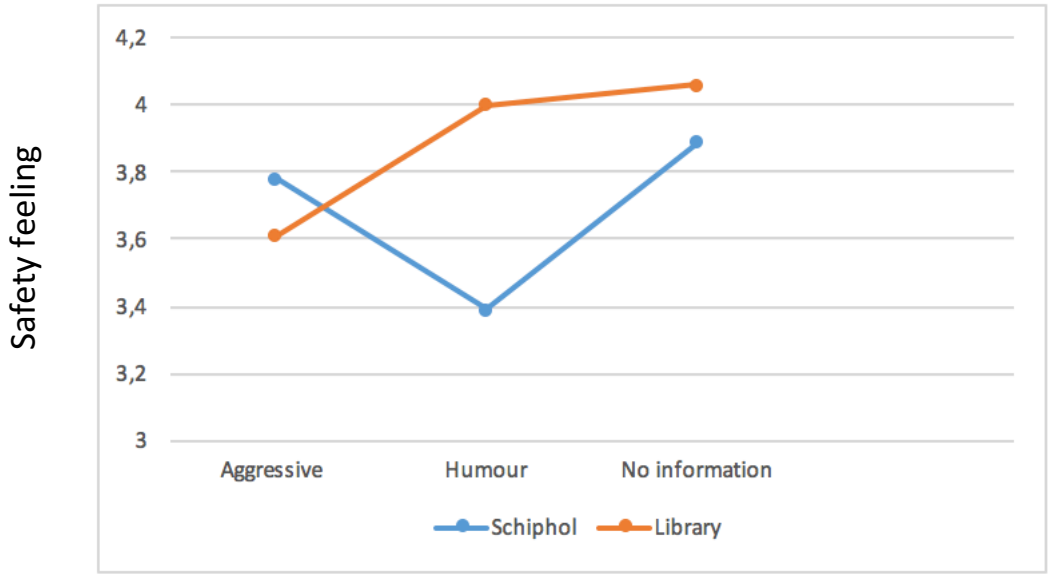

Figure 10: Visualisation of the marginal interaction effect of messaging strategy and environment on safety feeling

Effect	Wilks' Lambda	F	Sig.
Messaging strategy	.64	4.10	**.000**
Environment	.76	5.18	**.000**
Environment * Messaging strategy	.75	2.55	**.004**

Figure 11: MANOVA (Multivariate Tests Wilks' Lambda)

Effect		F	Sig.
Messaging strategy	Safety feeling	1.87	.159
	Feeling of being at risk	.07	.937
	Privacy perception	17.45	**.000**
	General attitude	5.42	**.006**
	Intention of the policy makers	1.00	.372
	Interpretation of an ambiguous situation	.78	.463
Type of environment	Safety feeling	2.27	.135
	Feeling of being at risk	8.74	**.004**
	Privacy perception	.33	.565
	General attitude	2.29	.133
	Intention of the policy makers	16.21	**.000**
	Interpretation of an ambiguous situation	.50	.483
Environment * Messaging strategy			
	Safety feeling	2.77	*.067*
	Feeling of being at risk	.81	.448
	Privacy perception	3.76	**.027**
	General attitude	1.05	.353
	Intention of the policy makers	2.19	.117
	Interpretation of an ambiguous situation	2.26	.109

Figure 12: MANOVA: (Test of Between-Subjects Effects)

5. Conclusions and discussion

The research question of this study was: *What are the effects of the messaging strategy and difference in environments on the effectiveness of face recognition?*' In order to answer this question, an experimental design was prepared. Below, the conclusions of the study are discussed in comparison to existing literature. Consequently, the limitations, future research and practical implications are presented.

5.1 Effect of messaging strategy

The expectation was that an aggressive messaging strategy for the usage of face recognition cameras would cause more positive effects for face recognition cameras, in contrast to a humorous messaging strategy or no information about face recognition surveillance. The reason for this is that a high credible source can use stronger fear appeals (Hewgill & Miller, 1965), use more opinionated statements (Miller & Lobe, 1967; Miller & Baseheart, 1969), and still be persuasive. It was also found by Burgoon et al. (1975), that highly competent sources produced more attitude change with high intensity language. This was also supported by Levine (2000), who stated that the presence of camera surveillance must be communicated in such manner, that the individuals have the feeling that criminal behaviour can be punished by an authority figure. Thus, it is expected that highly competent sources, such as the police and municipalities, benefit more from an intense, hard and unfriendly approach.

The results showed a main effect of messaging strategy on the effects of face recognition cameras, which means that people evaluate the situation with no information about face recognition surveillance more positive than a situation where they were faced with a humorous strategy or aggressive strategy. This was not expected, but it can be explained by the social impact theory from Latané (1981), which suggests that the imagined presence or actions of other individuals (i.e., surveillance cameras) has an influence on the subjective feelings, emotions and impressions. In the present study, the different signages had a more negative influence on the emotions of the respondents towards face recognition cameras, in contrast to no information. Besides, the messaging strategy also had effects on privacy perception and general attitude. The results proved that people thought that their privacy was more respected when they did not come in contact with a sign about face recognition camera surveillance. Besides, their general attitude towards face recognition cameras was more positive when they did not come in contact with a signage. This effect was also found by Gill and Spriggs (2005). Individuals who were aware of cameras, scored lower on safety feeling than those who were not aware of camera surveillance. The placement of camera surveillance into the environment influenced the safety perception of the environment as a site of potential risk. The environment was apparently less safe than they initially thought. Expanding on this reasoning, peoples' willingness to accept facial recognition cameras initially seemed high, but when they became extra aware of the surveillance with the different signages, they felt more threatened. This could be the consequence of a chilling effect. In these situations, people become more self-conscious and less freewheeling, knowing that they are being watched by the police and municipalities (Zheng, 2016).

5.2 Effects of environment

The expectation was that a threatening environment would cause more positive effects for face recognition cameras, in contrast to an environment where the threat is low. The acceptance for camera surveillance is more positive in functional places and it depends on whether people can imagine any personal advantages from camera surveillance in the particular environment (Vitalis, 1998; Holscher, 2003; Klauser, 2007; Taylor, 2010; Strikker, 2016). Taylor (2010) demonstrated that it was important for pupils from an English school that the motivation for implementing cameras was clear. When the cameras were used to counteract criminal behaviour and vandalism, it appeared that the reduced privacy was less important. When the threat is low, it is likely that the surveillance will be interpreted rather different than a threatening environment: 'Why am I under surveillance while this environment is not threatening?' Kay, Wheeler, Bargh and Rossa (2004) showed that such an ambiguous situation can also direct normative behaviour. When individuals were primed with business objects, this led to a more competitive-relevant word completion and competitive interpretation of an ambiguous social situation. Thus, the placement of cameras in an ambiguous situation may inspire distrust and an overall negative attitude towards surveillance.

The results showed that this hypothesis was not supported. In this study, the environment did not influence safety feeling, privacy perception, general attitude or the interpretation of an ambiguous situation. An explanation for finding these results is that people did not consider Schiphol as a threatening location and the library as a low threat location. Although the pretest proved that Schiphol was an appropriate location to make use of face recognition cameras and the library an inappropriate location, the library also had a few characteristics of high-threat. For example, it was a busy, large and public library. However, the environment did have an effect on the feeling of being at risk and the perceived intention of the controllers. The results showed that the perceived intention of the policy makers was more positive at Schiphol than at the library, which was in line with previous literature, because the acceptance for camera surveillance is more positive in functional places (Vitalis, 1998; Holscher, 2003). According to Klauser (2007), people tend to accept video-surveillance when they can imagine any personal advantages from camera surveillance in the particular environment and the use of cameras must be justified and proportionate to its function (Introna & Nissenbaum, 2010). Besides, people felt more at risk at Schiphol than at the library and this was not in line with previous literature. An explanation for finding these results is that a busy area like Schiphol is more related to external threats compared to a library.

5.3 Interaction effects of environment and messaging strategy

It was expected that an aggressive messaging strategy caused more positive effects for face recognition cameras in a high-threat environment, in contrast to an aggressive messaging strategy in a low-threat environment. It was also expected that a humorous messaging strategy caused more positive effects for face recognition cameras in a low-threat environment, in contrast to an aggressive messaging strategy

The results showed that there was an interaction effect on privacy perception, which means that an aggressive messaging strategy caused a more positive privacy perception in the environment with a high threat in contrast to an aggressive strategy in the environment with a low threat. This is in line with previous literature, because especially in a situation where the usage of surveillance cameras is open to multiple interpretations, sharing a sense

of identity affects the degree to which it is seen as an invasion of privacy (O'Donnell et al., 2010). Also, there was a marginal interaction effect on safety feeling, which means that a humorous messaging strategy in the environment with a high threat, caused a more negative safety feeling, in contrast to a humorous strategy in the environment with a low threat. This is also in line with previous literature, because the placement of cameras in an environment with a low threat may inspire distrust and an overall negative attitude towards surveillance. In such a situation, it was better to alleviate the impact of authoritative behaviour with humour (Duszak, 2002). However, we did not find any interaction effects on feeling of being at risk, general attitude, intention of the policy makers and the interpretation of an ambiguous situation. One explanation for not finding these effects is related to social expectations regarding face recognition camera surveillance. The results show that people were more positive about face recognition cameras when they were not confronted with it, in contrast to a humorous or aggressive approach. This shows that variation in messaging strategy and environment does not matter anymore, because in general people were more negative about the surveillance, regardless of the signage and environment. The fact that the respondent did not consider Schiphol as a threatening location and the library as a low threat location, could also be an explanation for not finding these effects.

5.4 Limitations and future research

Although the study was carefully prepared, it consists limitations and shortcomings. Besides, it also highlighted a number of topics on which further research would be beneficial. This study proved that cameras have an effect on the subjective feelings, emotions and impressions. However, this study did not consider the impact of these emotions and it is still unexamined whether this would actually lead to behavioural change. For example, future research could investigate if the effect of cameras surveillance on the subjective feelings leads to actual behavioural change, such as pro-social helping behaviour.

Besides, the current study did not consider different personality traits. When studying effects of environmental factors on human behaviour it is very important to take dispositional factors into account (Bloch, Brunel & Arnold, 2003; Mehrabian, 1977). Future research could look into the degree of innovativeness of the respondents. According to Frambach and Schillewaert (2002), personal innovativeness has a direct influence on the acceptance of a new technology. Some individuals are accepting certain innovations earlier than others and future research could investigate if this also applies to the acceptance of face recognition cameras. In addition, the personal vulnerability to environmental cues could be investigated, by including locus of control as a personality variable. The effects of locus of control on different environmental situations are already examined by Jansen, Giebels, van Rompay and Junger (2018), but not with the usage of face recognition cameras in different environments.

Moreover, when the respondents became extra aware of the surveillance by the different signages, they felt more threatened and this could be the consequence of a chilling effect. Thus, in addition to confronting people with different signages of face recognition camera surveillance, future research could explore to what extent people are affected by more subtle means. For example, an image of the watching eye of a camera.

Another limitation is that in this study, the environment did not influence safety feeling, privacy perception, general attitude or the interpretation of an ambiguous situation.

The reason for this could be the chosen environments. For example, the locations were both public, large and busy areas. It is likely that the complexity of these areas moderates the effects of security cameras. This is also examined by Welsh and Farrington (2008), who indicate that cameras work best in small, well-defined areas such as parking lots and did not have significant desirable effects in public settings. Future research could focus on environments where less factors compete for attention, such as parking lots.

Furthermore, the results showed that the perceived intention of the policy makers was more positive at a high-threat environment than at a low-threat environment. Future research could examine the effects of signages at low-threat environments that provide information about the general identity of the camera controllers. For example, that they are professionally trained authorised individuals and subject to regular independent inspection.

Another limitation is the quality of the VR glasses. The quality was not very high and the respondents were not able to move in the environment. Due to practical constraints, it was not possible to make use of better Virtual Reality glasses, because these glasses are only suitable for a powerful PC or laptop. Future research could make use of VR glasses with a better quality. Due to recent developments, the virtual reality glasses are getting better and in future research it will be possible to make use of a better quality VR film with a higher resolution. However, future research could also focus on findings obtained from a real life setting. Also, in other contexts or a setting during day versus night.

In addition, an important limitation of the study is that virtual reality is a relative new technology and for most of the respondents it was the first time they saw a movie in virtual reality. This had the consequence that it generated experiences of awe (situations in which users' emotions arises as a consequence of facing a new, complex situation) and this has an effect on final decisions and satisfaction (Rudd, Vohs, & Aaker, 2012).

Furthermore, the order of the measuring instrument was a limitation, meaning that there was an order-effect bias. The instrument started with the construct 'safety perception'. Afterwards, the respondents were providing their interpretation of the ambiguous situation, which had the consequence that the respondents were framed into the 'safety' frame. This can also be seen in the results: a lot of respondents made use of words which relate to safety. This is called an assimilation effect: participants' judgement shift toward an anchor after it is introduced (DeMoranville & Bienstock, 2003). For this reason, future studies should ask the interpretation of an ambiguous situation at the start of the questionnaire, so that an assimilation effect can not take place.

5.6 Practical implications

The environment with a high threat would cause more positive effects for face recognition camera surveillance, but this is not proven. Only the perceived intention of the policy makers for camera surveillance was more clear at Schiphol, but the feeling of being at risk scored higher in this location. For this reason, it is recommended to enhance the perceived intention of the policy makers at a location with a low threat. For example, by making it more clear why they are being surveilled and communicate that the authorities and operators do not abuse the surveillance system.

The study also showed that the respondents are the most positive about face recognition cameras when they are not confronted with signs about the actual surveillance. However, this is not recommended because the police and municipality must inform the citizens about the usage of face recognition cameras. For this reason, this study examined which messaging strategy works the best in each context. Based on the outcomes, it is recommended to make use of humorous information about face recognition cameras in less threatening situations where cameras are not expected, because the respondents felt safer when they were confronted with humorous information at the situation with a low threat, in contrast to humorous information at the situation where the threat was high. Besides, to enhance the perceived privacy it is recommended to make use of an aggressive warning notice at the high-threat location, in contrast to a warning sign at the low-threat location.

References

Aarts, H., & Dijksterhuis, A. (2003). The silence of the library: environment, situational norm, and social behavior. *Journal of personality and social psychology, 84*(1), 18-28

Abrams, D., Wetherell, M., Cochrane, S., Hogg, M. A., & Turner, J. C. (1990). Knowing what to think by knowing who you are: Self-categorization and the nature of norm formation, conformity and group polarization. *British journal of social psychology, 29*(2), 97-119.

Akers, R. L. (1990). Rational choice, deterrence, and social learning theory in criminology: The path not taken. *J. Crim. L. & Criminology, 81*, 653.

Altman, D. G. (1999). *Practical statistics for medical research.* New York, NY: Chapman & Hall/CRC Press.

Armitage, R. (2002). To CCTV or not to CCTV. *A review of current research into the effectiveness of CCTV systems in reducing crime*. London: Nacro

Barrett, D. (2013). One surveillance camera for every 11 people in Britain, says CCTV survey. *The Telegraph, 10*. Retrieved September 28, 2018, from https://www.telegraph.co.uk/technology/10172298/One-surveillance-camera-for-every-11-people-in-Britain-says-CCTV-survey.html

Bloch, P. H., Brunel, F. F., & Arnold, T. J. (2003). Individual differences in the centrality of visual product aesthetics: Concept and measurement. *Journal of consumer research, 29*(4), 551-565.

Bowman, D. A., & McMahan, R. P. (2007). Virtual reality: how much immersion is enough?. *Computer, 40*(7).

Braga, A. A., & Weisburd, D. L. (2012). The effects of focused deterrence strategies on crime: A systematic review and meta-analysis of the empirical evidence. *Journal of Research in Crime and Delinquency, 49*(3), 323-358.

Burgoon, M., Denning, V. P., & Roberts, L. (2002). Language expectancy theory. *The persuasion handbook: Developments in theory and practice*, 117-136.

Burgoon, M., Jones, S. B., & Stewart, D. (1975). Toward a Message-Centered Theory of Persuasion: Three Empirical Investigations of Language Intensity. *Human Communication Research, 1*(3), 251-256.

CBS (2014). *Integrale Veiligheidsmonitor 2014.* Retrieved April 22, 2017, from http://www.veiligheidsmonitor.nl

Chellappa, R. K. (2008). Consumers' trust in electronic commerce transactions: the role of perceived privacy and perceived security. *under submission, 13.*

Cohen, L. E., & Felson, M. (1979). Social change and crime rate trends: A routine activity approach. *American sociological review*, 588-608.

Cole, M. (2002). Signage and Surveillance: Interrogating the Textual Context of CCTV in the UK. *Surveillance & Society, 2*(2/3).

Davies, A. C., & Velastin, S. A. (2005). A progress review of intelligent CCTV surveillance systems. *Proc. IEEE IDAACS,* 417-423.
DeMoranville, C. W., & Bienstock, C. C. (2003). Question order effects in measuring service quality. *International Journal of Research in Marketing, 20*(3), 217-231.

Ditton, J. (2000). Crime and the city: Public attitudes towards open-street CCTV in Glasgow. *British Journal of Criminology, 40*, 692–709.

Duszak, A. (Ed.). (2002). *Us and others: Social identities across languages, discourses and cultures* (Vol. 98). John Benjamins Publishing.

Fay, S. J. (1998). Tough on crime, tough on civil liberties: some negative aspects of Britain's wholesale adoption of CCTV surveillance during the 1990s. *International Review of Law, Computers & Technology, 12(*2), 315-347.

Fishbein, M. E. (1967). *Readings in attitude theory and measurement.* New York: Wiley.

Frambach, R. T., & Schillewaert, N. (2002). Organizational innovation adoption: A multi-level framework of determinants and opportunities for future research. *Journal of business research, 55*(2), 163-176.

Graham, E. E., Papa, M. J., & Brooks, G. P. (1992). Functions of humor in conversation: Conceptualization and measurement. *Western journal of Communication, 56* ,161-183.

Hirschi, T. (2002). *Causes of Delinquency*. New Brunswick, NJ: Transaction Publishers.

Honess, T., & Charman, E. (1992). *Closed circuit television in public places: Its acceptability and perceived effectiveness.* London: Home Office.

Huttinga, R. (2011). *Cameratoezicht; de Creatie en Ervaring van een Interdictory space: Onderzoek naar de invloed van (camera) toezicht op de fysieke omgeving en mentale beleving van de Beurstraverse te Rotterdam (de Koopgoot).* (Bachelorthesis, Radboud University of Nijmegen). Retrieved August 12, 2019, from https://theses.ubn.ru.nl/bitstream/handle/123456789/2697/Huttinga%2c_Richard_1.pdf?sequence=1

Jansen, A. M., Giebels, E., Van Rompay, T. J., & Junger, M. (2018). The influence of the presentation of camera surveillance on undesired and pro-social behavior. *Frontiers in psychology, 9*, 1937.

Kim, K., Park, K. K., & Lee, J. H. (2014). The influence of arousal and expectation on eyewitness memory in a virtual environment. *Cyberpsychology, Behavior, and Social Networking, 17*(11), 709-713.

Klauser, F. R. (2007). Difficulties in revitalizing public space by CCTV: Street prostitution surveillance in the Swiss city of Olten*. European Urban and Regional Studies, 14*(4), 337-348.

Kotler, P. (2000). *Marketing management, millennium ed.* Englewood Cliffs: Prentic Hall.

Kroener, I. (2016). *CCTV: a technology under the radar?.* New York: Routledge.

Landis, J. R., & Koch, G. G. (1977). The measurement of observer agreement for categorical data. *Biometrics, 33,* 159-174.

Levine, M. (2000). SIDE and Closed Circuit Television (CCTV): Exploring surveillance in a public space. In T. Postmes, R. Spears, M. Lea, S. Reicher (Eds.), *Side issues centre-stage: Recent developments in studies of de-individuation in groups.* Amsterdam: Royal Netherlands Academy of Arts and Sciences.

Mann, M., & Smith, M. (2017). Automated facial recognition technology: Recent developments and approaches to oversight. *UNSWLJ, 40*, 121.

McGarty, C., Turner, J. C., Hogg, M. A., David, B., & Wetherell, M. S. (1992). Group polarization as conformity to the prototypical group member. *British Journal of Social Psychology, 31*(1), 1-19.

Mehrabian, A. (1977). Individual differences in stimulus screening and arousability. *Journal of Personality, 45*(2), 237-250.

Meyer, J. C. (2000). Humor as a double-edged sword: Four functions of humor in communication*. Communication theory, 10*(3), 310-331.

Möllers, N., & Hälterlein, J. (2013). Privacy issues in public discourse: the case of “smart” CCTV in Germany*. Innovation: The European Journal of Social Science Research, 26*(1-2), 57-70.

O'Donnell, A. T., Jetten, J., & Ryan, M. K. (2010). Who is watching over you? The role of shared identity in perceptions of surveillance. *European Journal of Social Psychology, 40*(1), 135-147.

Phillips, C. (1999). A review of CCTV evaluations: Crime reduction effects and attitudes towards its use. *Crime prevention studies, 10*(1), 123-155.

Piza, E. L., Caplan, J. M., & Kennedy, L. W. (2014). Analyzing the influence of micro-level factors on CCTV camera effect. Journal of Quantitative Criminology, 30(2), 237-264.
Ring, T. (2016). Privacy in peril: is facial recognition going too far too fast?. *Biometric Technology Today, 2016*(7), 7-11.

Van Rompay, T.J.L., De Vries, P.W., Damink, M.T.: “For your safety”: effects of camera surveillance on safety impressions, situation construal and attributed intent. In: MacTavish, T., Basapur, S. (eds.) PERSUASIVE 2015. LNCS, vol. 9072, pp. 141–146. Springer, Cham (2015). https://doi.org/10.1007/978-3-319-20306-5_13

Royakkers, L., Timmer, J., Kool, L., & van Est, R. (2018). Societal and ethical issues of digitization. *Ethics and Information Technology, 20*(2), 127-142.

Rudd, M., Vohs, K. D., & Aaker, J. (2012). Awe expands people’s perception of time, alters decision making, and enhances well-being. *Psychological science, 23*(10), 1130-1136.

Saulnier, A., & Thompson, S. N. (2016). Police UAV use: Institutional realities and public perceptions. *Policing: An International Journal of Police Strategies & Management, 39*(4), 680-693.

Taylor, E. (2010). I spy with my little eye: The use of CCTV in schools and the impact on privacy. *The Sociological Review, 58*(3), 381-405.

Taylor, E. (2012). Awareness, understanding and experiences of CCTV amongst teachers and pupils in three UK schools. *Video Surveillance: Practices and Policies in Europe, 18*, 1.

Van der Veen, G. (2006). *Interpreting Fear, Crime, Risk and Unsafety. Conceptualisation and measurement.* Boom Juridische uitgevers, Den Haag.

Welsh, B. C., & Farrington, D. P. (2008). Effects of closed circuit television surveillance on crime. *Campbell systematic reviews, 17*, 2-73.

Welsh, B. C., & Farrington, D. P. (2009). Public area CCTV and crime prevention: an updated systematic review and meta-analysis. *Justice Quarterly, 26*(4), 716-745.

Williams, C. A. (2003). Police Surveillance and the Emergence of CCTV in the 1960s. *Crime Prevention and Community Safety, 5*(3), 27-37.

Witmer, B. G., & Singer, M. J. (1998). Measuring presence in virtual environments: A presence questionnaire. *Presence: Teleoperators and virtual environments, 7*(3), 225-240.

Zheng, T. (2016). Advanced Surveillance Technologies: Privacy and Evidentiary Issues. *Cornell Law School J.D. Student Research Papers, 37.*

Appendices

Appendix 1: First pretest and results

Introductie:
Voor mijn master scriptie aan de Universiteit van Twente doe ik onderzoek naar de werking van communicatie op het effect van cameratoezicht op verschillende locaties. Voor het werkelijke onderzoek wil ik in dit vooronderzoek testen hoe de Nederlandse burger denkt over de verschillende locaties waar gezichtsherkenning cameratoezicht toegepast kan worden. De resultaten van dit vooronderzoek zullen worden gebruikt in het hoofdonderzoek en zijn daarom erg belangrijk. Ik zal het daarom zeer op prijs stellen dat u het onderzoek zo eerlijk mogelijk invult. Het onderzoek is volledig anoniem, u hoeft uw naam niet op te geven.
Instructie:

Op de volgende pagina's zullen verschillende locaties getoond worden, waarbij iedere keer dezelfde stellingen worden getoond. Op een schaal van 1 tot 5 kunt u aangeven in hoeverre het u eens of oneens bent met de stellingen.
Heel erg bedankt voor uw hulp!

Winkelcentrum

Ik vind dit een logische locatie voor gezichtsherkenning cameratoezicht.

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zie dit als een verbazende locatie voor gezichtsherkenning cameratoezicht

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens

- Helemaal mee eens

Ik ben van mening dat dit een natuurlijke locatie is voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zal verontwaardigd zijn als op deze locatie gezichtsherkenning cameratoezicht plaats zal vinden
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Schiphol

Ik vind dit een logische locatie voor gezichtsherkenning cameratoezicht.
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zie dit als een verbazende locatie voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens

- Helemaal mee eens

Ik ben van mening dat dit een natuurlijke locatie is voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zal verontwaardigd zijn als op deze locatie gezichtsherkenning cameratoezicht plaats zal vinden
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Bank

Ik vind dit een logische locatie voor gezichtsherkenning cameratoezicht.
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zie dit als een verbazende locatie voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens

- Helemaal mee eens

Ik ben van mening dat dit een natuurlijke locatie is voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zal verontwaardigd zijn als op deze locatie gezichtsherkenning cameratoezicht plaats zal vinden
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Treinstation

Ik vind dit een logische locatie voor gezichtsherkenning cameratoezicht.
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zie dit als een verbazende locatie voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik ben van mening dat dit een natuurlijke locatie is voor gezichtsherkenning cameratoezicht

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zal verontwaardigd zijn als op deze locatie gezichtsherkenning cameratoezicht plaats zal vinden

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens
-

Supermarkt

Ik vind dit een logische locatie voor gezichtsherkenning cameratoezicht.

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zie dit als een verbazende locatie voor gezichtsherkenning cameratoezicht

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik ben van mening dat dit een natuurlijke locatie is voor gezichtsherkenning cameratoezicht

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zal verontwaardigd zijn als op deze locatie gezichtsherkenning cameratoezicht plaats zal vinden

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Bibliotheek

Ik vind dit een logische locatie voor gezichtsherkenning cameratoezicht.

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zie dit als een verbazende locatie voor gezichtsherkenning cameratoezicht

- Helemaal niet mee eens

- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik ben van mening dat dit een natuurlijke locatie is voor gezichtsherkenning cameratoezicht

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zal verontwaardigd zijn als op deze locatie gezichtsherkenning cameratoezicht plaats zal vinden

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ziekenhuis

Ik vind dit een logische locatie voor gezichtsherkenning cameratoezicht.

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zie dit als een verbazende locatie voor gezichtsherkenning cameratoezicht

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik ben van mening dat dit een natuurlijke locatie is voor gezichtsherkenning cameratoezicht

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zal verontwaardigd zijn als op deze locatie gezichtsherkenning cameratoezicht plaats zal vinden

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Gemeentehuis

Ik vind dit een logische locatie voor gezichtsherkenning cameratoezicht.

- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens

- Helemaal mee eens

Ik zie dit als een verbazende locatie voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik ben van mening dat dit een natuurlijke locatie is voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zal verontwaardigd zijn als op deze locatie gezichtsherkenning cameratoezicht plaats zal vinden
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Schoolgebouw

Ik vind dit een logische locatie voor gezichtsherkenning cameratoezicht.
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens

- Mee eens
- Helemaal mee eens

Ik zie dit als een verbazende locatie voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik ben van mening dat dit een natuurlijke locatie is voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zal verontwaardigd zijn als op deze locatie gezichtsherkenning cameratoezicht plaats zal vinden
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Parkeergarage

Ik vind dit een logische locatie voor gezichtsherkenning cameratoezicht.
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens

- Helemaal mee eens

Ik zie dit als een verbazende locatie voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik ben van mening dat dit een natuurlijke locatie is voor gezichtsherkenning cameratoezicht
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Ik zal verontwaardigd zijn als op deze locatie gezichtsherkenning cameratoezicht plaats zal vinden
- Helemaal niet mee eens
- Niet mee eens
- Niet mee eens en niet mee oneens
- Mee eens
- Helemaal mee eens

Conclusion first preliminary study:

	Logisch	Verbazing	Natuurlijk	Verontwaardigd
Winkelcentrum	3.23	2.77	3.00	2,69
Schiphol	**4.23**	**1.69**	**3.92**	**1.62**
Bank	4.69	2.00	3.69	2.23
Treinstation	4.61	1.62	4.08	1.92
Supermarkt	2.46	3.38	2.46	3.23
Bibliotheek	**1.62**	**4.31**	**1.77**	**4.15**
Ziekenhuis	2.62	3.46	2.69	3.31
Gemeentehuis	2.92	3.00	2.92	3.15
Schoolgebouw	2.31	4.00	2.46	3.62
Parkeergarage	3.08	3.15	3.08	3.23

Appendix 2: Second pretest and results

Introductie:
Voor mijn master scriptie aan de Universiteit van Twente doe ik onderzoek naar de werking van communicatie op het effect van cameratoezicht. Voor het werkelijke onderzoek wil ik in dit vooronderzoek testen hoe de Nederlandse burger denkt over de verschillende manieren van kennisgeving waarop gezichtsherkenning cameratoezicht toegepast kan worden. De resultaten van dit vooronderzoek zullen worden gebruikt in het hoofdonderzoek en zijn daarom erg belangrijk. Ik zal het daarom zeer op prijs stellen dat u het onderzoek zo eerlijk mogelijk invult. Het onderzoek is volledig anoniem, u hoeft uw naam niet op te geven.

Instructie:
Op de volgende pagina's zullen verschillende kennisgevingen getoond worden. De kennisgevingen zijn in het Engels, maar het zijn gangbare aankondigen voor het gebruik van cameratoezicht. Op een schaal van 1 tot 5 kunt u aangeven in hoeverre het u een gematigde of extreme kennisgeving vindt. Heel erg bedankt voor uw hulp!

The face recognition camera system is connecting with the security headquarter
- Zeer gematigd
- Gematigd
- Niet gematigd en niet extreem
- Extreem
- Zeer extreem

Beware, this environment is being guarded by face recognition cameras!
- Zeer gematigd
- Gematigd
- Niet gematigd en niet extreem
- Extreem
- Zeer extreem

We use face recognition cameras to protect your safety here
- Zeer gematigd
- Gematigd
- Niet gematigd en niet extreem
- Extreem
- Zeer extreem

Taping now! Your face is monitored by face recognition cameras!!
- Zeer gematigd
- Gematigd
- Niet gematigd en niet extreem
- Extreem
- Zeer extreem

The face recognition camera system is being operated now

- Zeer gematigd
- Gematigd
- Niet gematigd en niet extreem
- Extreem
- Zeer extreem

Security notice, you are under face recognition camera surveillance

- Zeer gematigd
- Gematigd
- Niet gematigd en niet extreem
- Extreem
- Zeer extreem

Please smile, face recognition cameras are running!

- Zeer gematigd
- Gematigd
- Niet gematigd en niet extreem
- Extreem
- Zeer extreem

Warning, face recognition cameras in operation

- Zeer gematigd
- Gematigd
- Niet gematigd en niet extreem
- Extreem
- Zeer extreem

Conclusion second preliminary study:

Sentences	**Score**
The face recognition camera system is connecting with the security headquarter	2.55
Beware, this environment is being guarded by face recognition cameras!	3.45
We use face recognition cameras to protect your safety here	2.36
Taping now! Your face is monitored by face recognition cameras!!	**4.09**
The face recognition camera system is being operated now	2.73
Security notice, you are under face recognition camera surveillance	2.64
Please smile, face recognition cameras are running!	**2.18**
Warning, face recognition cameras in operation	3.36

Appendix 3: Screenshots of stimulus material

Schiphol:

Library:


WARNING
TAPING NOW!
YOUR FACE IS MONITORED BY
FACE RECOGNITION CAMERAS!!
POLITIE
obe
expositieruimte


nederlands
nieuw

Appendix 4: Questionnaire

Introduction

Beste deelnemer,

Bedankt voor uw deelname aan dit onderzoek. Het onderzoek maakt deel uit van mijn masterscriptie voor de studie Communicatiewetenschap aan de Universiteit Twente. Het onderzoek gaat over veiligheidsgevoelens van de Nederlandse burger en u bekijkt een korte film met behulp van een Virtual Reality bril. Over deze film worden vervolgens een aantal vragen gesteld. Hierover wordt alleen uw mening gevraagd: er zijn dus geen goede of foute antwoorden. Het onderzoek zal ongeveer 10 minuten in beslag nemen.

De resultaten worden uitsluitend gebruikt voor mijn masterscriptie. Uw gegevens worden volledig anoniem verwerkt. Bovendien kunt u elk moment stoppen met het onderzoek.

Heel erg bedankt voor uw deelname!

Roy Strikker
r.strikker@student.utwente.nl

- Hierbij verklaar ik dat ik het bovenstaande heb gelezen en stem geheel vrijwillig in met deelname aan dit onderzoek.

Declaration of age

- Bent u 18 jaar of ouder?

Demographic variables

- Wat is uw leeftijd?
- Wat is uw geslacht?

Instruction

- Voorafgaand aan de vragenlijst zult u met behulp van de Virtual Reality bril een kort filmpje van ongeveer een minuut te zien krijgen. Door middel van dit filmpje wordt er een beeld geschetst waarover u vervolgens een aantal vragen mag invullen.

The VR films

- The respondents will be randomly assigned to one of the 6 different films

The survey (on the basis of a 5-point likert scale)

- De volgende vragen gaan over de veiligheid in de geschetste situatie van de film

1. Ik denk dat deze situatie onveilig is
2. Ik heb de indruk dat geweld weinig voorkomt in deze situatie
3. Ik heb het gevoel dat ik in deze situatie gevaar loop
4. Ik voel mij veilig in deze situatie

5. Ik heb het idee dat er in deze situatie veel overlast plaatsvindt
6. Ik zal mij op mijn gemak voelen in deze situatie

Ik zal de algehele veiligheidssituatie beoordelen met een

1	2	3	4	5	6	7	8	9	10

Geef een beschrijving van de volgende situatie:

- Er volgen nu een aantal vragen die gaan over de privacy in de geschetste situatie van de film

1. Ik vind dat in deze situatie de privacy geschonden wordt
2. Ik zou mij gecontroleerd voelen in deze situatie
3. Ik denk dat deze situatie een basisrecht op privacy schendt
4. Ik zal mij bekeken voelen in deze situatie
5. Mijn bewegingsvrijheid wordt gerespecteerd in deze situatie

- Om de veiligheid van de Nederlandse burgers te kunnen waarborgen, wordt er steeds meer gebruik gemaakt van gezichtsherkenning cameratoezicht. De volgende vragen gaan daarom over de intentie van de beleidsmakers met betrekking tot dit gebruik in de situatie van het filmpje

1. Met het inzetten van gezichtsherkenning camera's in deze situatie worden mensen onnodig lastiggevallen
2. Ik denk dat gezichtsherkenning camera's in deze situatie alleen worden gebruikt voor de veiligheid van burgers

3. Ik ben van mening dat de mensen in deze situatie onnodig worden gecontroleerd
4. Ik vind het doel voor het gebruik van gezichtsherkenning camera's in deze situatie duidelijk
6. Ik denk dat het gebruik van gezichtsherkenning camera's hier acceptabel is

- De volgende vragen gaan over uw algemene houding tegenover gezichtsherkenning cameratoezicht

1. Ik denk dat gezichtsherkenning camera's een afschrikwekkende werking op misdadigers hebben
2. Ik ben van mening dat gezichtsherkenning camera's helpen bij het opsporen van criminelen
3. Ik vind dat gezichtsherkenning camera's helpen bij het beschermen van de samenleving
4. Door de aanwezigheid van gezichtsherkenning camera's maak ik mij meer zorgen
5. Ik heb de indruk dat gezichtsherkenning camera's de kans op criminaliteit verminderen
6. Ik denk dat ondanks het gebruik van gezichtsherkenning camera's, criminelen toch de wet zullen overtreden
7. Ik verwelkom in het algemeen het gebruik van gezichtsherkenning camera's
8. In het algemeen ben ik tegen het gebruik van gezichtsherkenning cameratoezicht
9. Ik denk dat gezichtsherkenning camera's een positief effect hebben op de veiligheid van burgers
10. Ik vind dat gezichtsherkenning camera's de privacy aantasten

- Is de vermelding voor het gebruik van gezichtsherkenning camera's u opgevallen in het filmpje?

- Dit is het einde van het onderzoek. Hartelijk bedankt voor het invullen van mijn vragenlijst. Voor vragen of opmerkingen kunt u het direct aan mij vragen of eventueel op een later tijdstip via r.strikker@student.utwente.nl
- Roy Strikker