

**EXAMINING THE EFFECTS OF REAL AND IMPLIED SOCIAL PRESENCE**

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## **Abstract**

There is compelling evidence that the physical presence of others influences the decisions and behaviour of individuals. Recently in social presence research, the focus has turned to the influence of implied social presence, i.e., the knowledge or belief that one's behaviour is being (or could be) watched by another. The aim of this thesis is to establish how real and implied presence are similar or different from each other, and to investigate potential mechanisms that can account for the observed effects, such as self-awareness, cognitive load, and proximity. In chapter 1 I briefly review research on social presence, both real and implied, and discuss recent work which directly investigates the influence of social presence on gaze behavior and the implications of this work for understanding social attention. I then investigate the current gaps in social presence research, and assess how implied and real presence effects are similar or different from each other. Chapter 2 lays out what is understood thus far as implied social presence effects, investigating the time course of the effect and the role of self-awareness. In Chapter 3, I capture systematic patterns of social presence effects by use of a common metric of visual attention, and apply this method throughout all subsequent chapters as well as honing the paradigm to capture the effects of social presence in question. Chapter 4 uses this paradigm to examine the effects of cognitive load and physical proximity, on implied and real social presence. Changes in cognitive load reveal a quantitative difference between implied and real presence, and manipulations in proximity reveal a qualitative difference. Chapter 5 extends the consideration of social presence to purchasing behaviours. This examination reveals that social presence effects vary for looking behaviours and purchasing decisions, and that the former is a poor predictor of the latter. Throughout these seven studies, a total of 502 participants were recruited and tested. In Chapter 6 I discuss the results, outline their implications, limitations, and identify future studies that would advance further our

understanding of social presence.

## **Lay Summary**

My work compares a "real social presence effect" against what I call an "implied social presence effect". Implied social presence is achieved by pointing a monitoring device (i.e., camera) at another person and recording their behaviour. The studies show that people tend to avoid looking at provocative images when they believe they are being watched, and they look at the provocative images when they believe that they are not being watched. I examine how these general patterns of behaviour change with a range of different variables and might affect the types of purchases people make. In sum, my work shows that real and implied social presence have a profound effect on the ways people explore the world visually, and even what they chose to buy; and while real and implied social presence share many similarities, there are fundamental differences as well.

## **Preface**

All work presented in this dissertation was conducted in the Brain, Attention, and Reality Laboratory at the University of British Columbia, Point Grey campus. All projects and associated methods were approved by the University of British Columbia's Research Ethics Board [Towards a More Natural Approach to Attention Research 1-200, certificate #H10-00527]. A version of the introduction has been published [Nasiopoulos, E., Risko, E.F. & Kingstone, A. (2015). Social attention, social presence, and the dual function of gaze. In Aina Puce & Bennett I. Bertenthal (Eds.) *The Many Faces of Social Attention: Behavioral and Neural Measures*. Springer International Publishing AG]. A version of Chapter 2 - Study 1 has also been published [Nasiopoulos, E., Risko, E.F., Foulsham, T. & Kingstone, A. (2014). Wearable computing: Will it make people prosocial? *British Journal of Psychology*]. For these published works I was lead investigator, and was primarily responsible for the research design, the collection and analysis of the data, as well as manuscript composition. All co-authors were involved in research design and manuscript edits. Changes from these published documents have been made here for the sake of cohesion with the rest of the chapters. Pronoun changes have also been made throughout the documents.

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## **Dedication**

To all the students, supervisors and colleagues who have motivated me with their passion for research and psychology. And to the friends and family who have endured me rambling on about my passion for research.

## Chapter 1: Introduction

The simplest of social situations are known to influence changes in human behaviour and even regulate cognitive function (Latane, 1981). The presence of another individual is a well-established example of how social context can promote or mitigate certain behaviours. In 1897 Norman Triplett pioneered research in the area of social presence when he documented that cyclists logged faster race times in the presence of other cyclists. This finding piqued a lot of interest in this topic area and eventually led to Floyd Allport (1924) defining such effects as 'social facilitation'. Social facilitation, at its broadest level, refers to the consequences on behaviour derived by the presence of other individuals (Zajonc, 1965). For instance, the presence of others has been shown to influence people's interactions, self-awareness, and performance (Zajonc, 1965; Levine, Resnick & Higgins, 1993) or even alter the way they express their emotions (Buck, Losow, Murphy & Costanzo, 1992). In general, the presence of others elevates conformance to social norms, which is argued to be based on our need to attain approval or avoid the disapproval of others (Guerin, 1986). As a result people are more likely to donate money when they can be seen by another individual (Satow, 1975), and people will reduce levels of food intake in the presence of others (Herman, Roth & Polivy, 2003).

Social presence effects, however, are not limited to the physical presence of others. Trivial reminders of social presence alter behaviour in ways similar to when an actual person is present (Levine, Resnick & Higgins, 1993). For instance, images of eyes can evoke cooperative behaviour in people augmenting the likelihood of individuals cleaning up litter from cafeteria tables (Ernest-Jones, Nettle & Bateson, 2011), and even influence people to increase monetary contributions towards an 'honour box' system for consuming drinks (Bateson, Nettle & Roberts, 2006). Similarly, security cameras, which imply the presence of others, increase prosocial behaviours

with individuals being more likely to provide help to others in a public setting (Van Rompay, Vonk & Fransen, 2009).

In the present chapter an overview of the research findings on social presence will be presented. Possible gaps and limitations in the research will also be noted, and where relevant, how the research presented in the present thesis speaks to these outstanding issues. I will also be outlining what similarities or differences between implied and real presence may exist, and consider how the mechanisms underlying these effects may be the same or different.

### **1.1. Proposed Mechanisms**

Although the social presence literature set out to describe how performance was positively or negatively impacted on a task by the presence of others, over the years it has expanded to include general changes in behaviour rather than directional changes in performance on a specific task. The general definition of the effect is taken as the mere presence of someone -- or in the case of implied presence, the suggested presence of another person -- in social situations, that has an impact on the thoughts or observed behaviours of an individual (Allport, 1924). There have been numerous theories proposed as to why social presence effects occur. Zajonc (1965) suggested an Activation Theory for social presence effects that encompasses three secondary hypotheses: i) The Alertness Hypothesis - that people are uncertain of how observers will act while in the presence of others, so they become more alert (which can, for example, lead them to perform better on tasks); ii) The Monitoring Hypothesis - posits that social presence effects occur only when an individual is unfamiliar with the situation or the observers, as a lack of familiarity will increase an individual's uncertainty and arousal; and iii) The Challenge and Threat Hypothesis - suggests that individuals perform worse on complex tasks because of a heightened cardio-vascular response, and better on simple tasks because they experience a normal cardio-vascular response to the task. Note that it is

also the case that these three sub-processes/hypotheses are not necessarily mutually exclusive. For example, an unfamiliar situation may be perceived as a threat, which leads to an increase in alertness.

Although Zajonc (1965) revived the literature on social presence and favoured an arousal mechanism as the primary driver for social presence effects, there was little evidence to support the arousal hypothesis (Huguet, Galvaing, Monteil & Dumas, 1999). Zajonc himself acknowledged this point, stating that the evidence for arousal was both "indirect and scanty" (Zajonc, 1965). In light of the lack of empirical support for Zajonc's proposal, alternative hypotheses were quick to emerge. For instance, the Evaluation Approach to social presence was proposed by Henchy and Glass in 1968. According to this idea, it is not an increase in arousal that brings about social presence effects, but rather it is the fear of being evaluated. As with Zajonc's hypothesis, there was no definitive evidence to support the evaluation idea, nor was it clear how it was qualitatively or quantitatively distinct from the components that Zajonc had proposed.

By the 1980s, interest in these prior proposals had waned, and researchers began to focus on the role of attention in social presence effects, leading to the Attention Theory hypothesis (Carver & Scheier, 1981). This attentional account explains the influence of social presence through attentional mechanisms such as the Feedback - Loop model, which postulates that when people feel observed they turn attention on themselves, and it is this increased awareness of their own behaviour that causes the observed presence effect (Guerin, 2010). Again, however, the role of attention is not mutually exclusive from other factors (e.g., arousal), and most researchers working on social presence tend to agree that its effect reflects the involvement of several interconnected variables including arousal, evaluation, and attention (Guerin, 1986; Steinmetz & Pfattheicher, 2017).

## 1.2 Real Social Presence

Early research on presence effects generally found that the presence of others had a facilitatory effect on performance. For example, Travis (1925) demonstrated that individuals were more accurate in a motor task in the presence of others (see also Bergum & Lehr, 1963). In addition, researchers found improved performance in cognitive tasks, for example, when given simple math problems and word association tasks, people would perform better when another person was present (Dashiell, 1930). As research progressed, demonstrations of the interfering effects of the presence of others started to emerge (i.e., decreased performance in certain tasks when others were present; e.g., Pessin & Husband, 1933). These findings led to the influential idea that the presence of others facilitates performance of learned responses, but inhibits the acquisition of new knowledge (Zajonc, 1965). In a massive meta-analysis of 241 studies combining the results of nearly 24,000 participants (all studies done prior to 1982), the idea that the effect of social presence depends on the type of task (i.e., for complex tasks there is a negative effect of social presence, whereas with simple tasks there is a positive effect) was seemingly confirmed (Bond & Titus, 1983).

The Bond and Titus (1983) review also addressed the prevailing hypotheses regarding the mechanism(s) underlying social presence effects. The strongest contenders were that the effects were due to (a) evaluation apprehension and self-presentation (i.e., regulation of public image; Bond, 1982; Geen, 1985), (b) an overall general drive or increased alertness/arousal (i.e., energization of dominant/learned responses; Zajonc, 1965), or (c) factors, mediated by attention, relating to objective self-awareness (i.e., regulation of ideals of the self and actual performance; Carver & Scheier, 1981). In a subsequent review by Guerin (1986), which was more stringent in the selection criteria it applied (i.e., it focused on mere presence excluding any scenarios of co-

action) a robust social presence effect was found in the majority of the experiments, as long as the observer that was present was able to engage in the evaluation of the participant (e.g., rather than being busy with a non-related task or unable to actively observe the participant). Guerin (1986) concluded that the presence of another person increased one's likelihood of conforming to a public norm. At this point in the field, social presence effects were a well-established finding, and although there was still disagreement as to the underlying mechanism, it was accepted that arousal offered a poor account of the data and the opportunity to evaluate the participant was an important contributing factor to social presence effects.

While much of the early work on social presence effects focused on its influence on performance in relatively simple tasks, a related line of research emerged focusing on the influence of social presence on more complex behaviors. One of the central ideas driving this line of research stemmed from Guerin's (1986) review suggesting that the presence of others increases conformance to social norms. Preliminary research demonstrated, for example, that when participants are asked to sort materials containing erotic images, they would spend less time doing so when in the presence of others versus when they were alone (Weiss, Miller, Langan & Cecil, 1971). Children listening (on headphones) to an amusing story would laugh more when someone was present in the room than when they listened to the same story alone (Chapman, 1973); and individuals would increase the size of their donations if they knew they could be seen by others (Satow, 1975). Indeed, this latter effect has even been documented in children as young as five years old, where these children were given stickers and asked to share the stickers with another child. In the conditions where their actions were visible to another person, children were more likely to share their stickers with another child, indicating that even children at a young age are more likely to be generous and act in a prosocial way when there is an audience (Leimgruber,

Shaw, Santos & Olson, 2012). In the following section I describe a representative set of studies documenting important moderators of social presence effects and discuss briefly the proposed mechanisms.

There exist a number of demonstrations of individual difference measures that moderate the influence of social presence effects. Herman, Roth, and Polivy (2003) found that people will decrease their food intake in the presence of others when the prevalent norm is to eat less, whereas in situations where eating more is expected and signaled, individuals will increase their food intake. Critically, they found that this influence of social presence on food intake was related to individual differences in impression management, with people rating higher on impression management being more likely to conform to the cued norm in a social setting (Herman et al., 2003). Similarly, Ratner and Kahn (2002) found that people increased the variety of items they consumed when other individuals could observe their consumption choices. Interestingly, this “variety effect” was strong enough that when a group of participants were asked to choose what candy they would prefer to eat they would give up selecting their preferred candy in order to select a broader range of items. Ratner and Kahn (2002) also found that this “variety effect” was stronger in those who score higher on a self-monitoring scale. That is, individuals who frequently regulate their behavior as a function of the situation are more likely to modify their consumption behavior in response to the presence of others. Finally, in an extension of the research on social presence and charity, White and Peloza (2009) demonstrated that the influence of private versus public donation was related to individual differences in impression management. Collectively, these and related findings converge with the general notion that the presence of others increases conformance to social norms in the sense that individuals who are more likely to engage in acts of impression

management are more likely to be influenced by the presence of others (i.e., the behavior change in response to the presence of another person can be seen as a form of impression management).

Another important moderator of social presence effects is familiarity. Much of the work establishing this link has been conducted in the consumer behavior arena. Dahl, Manchada, and Argo (2001) investigated how social presence influences a product purchase of a typically embarrassing item (in their study buying condoms) where social presence is the source of potential embarrassment for the consumer. Participants were given money and sent to a pharmacy to purchase condoms. Physical social presence was manipulated by use of a trained confederate either standing next to the condom display, or not present in the control version of the procedure. Participants were given money to go purchase the product, and then returned to the experimenter to fill out questionnaires including a) how embarrassed they felt during the purchasing task, and b) how familiar they were with condom purchases. They also completed a manipulation check of their awareness of how many customers were present. Participants report significantly less embarrassment in the no presence condition when compared to the presence condition, but embarrassment was felt much more by those who were not familiar with condom purchases. The results point to familiarity with the type of purchase acting as a moderator of the presence effect. Familiarity is thought to result in greater automaticity with the purchase task and is hypothesized to reduce cognitive activity at the point of product selection (Alba & Hutchinson 1987), and in order to be embarrassed one needs to care about the evaluating social audience (Schlenker & Leary, 1982).

In a similar vein, Ashworth, Darke, and Schaller (2005) hypothesized that people would be more likely to redeem coupons in private versus public situations. In private situations, the lack of social presence allows for impressions of cheapness (due to using a coupon) no longer being a

factor. Using a scenario-based paradigm, people were more likely to report using a coupon if they were paying a bill when another person was not present compared to participants given the scenario where at the time of payment others were present. They found that people report avoiding coupon use in order to avoid appearing cheap. Participants were also more likely to use a coupon in the presence of an established friend than a romantic partner, because they viewed it as less important to make a positive impression in the former case.

Lastly, Luo (2005) demonstrated that the likelihood of impulsive purchasing (i.e., loss of one's self-control or the surrender to temptation in making a purchase) was influenced by the presence of others, and that this influence depended on the relation between the participant and the "social presence." Specifically, Luo (2005) reported that the presence of family members decreased impulsive purchases, whereas the presence of peers increased impulse buys. Luo (2005) explained this finding by arguing that peers are more likely to reward spontaneity and so impulsivity becomes more socially desirable, whereas family members might be more likely to have economic concerns such as wasting money or be more likely to bring out feelings of responsibility to others, making impulsive behaviour undesirable. Thus, the normative expectations of those 'others' alter the form of the social presence effect on purchasing behaviour. Additionally, both the familiarity of the act and the relation between the actor and the "social presence" can influence how the presence of others influences one's behavior.

The final influence of social presence effects to be discussed is the spatial proximity of others. According to Latane's (1981) Social Impact Theory, proximity should modulate "social strength" and as such the influence of social presence on behavior. Argo, Dahl, and Manchada, (2005) investigated how a consumer would change their behaviour if someone is physically present in an aisle where the individual is making a purchase. In their first experiment, participants went

to an actual store where they were asked to make a purchase of batteries. A confederate in the store, a few aisles away, would observe the participant and document any self-presentation behaviours, such as the extent of the participant's interaction with the display of batteries, as well as the number of people in the aisle. The results of the study indicated that participants would purchase the highest quality brand and spend the most money when others were present in the aisle. Interestingly, they found that while the number of people in the aisle influenced consumer's emotions (in particular annoyance, self-consciousness, confidence, and happiness), it did not change how participants engaged with the display or their brand choice (inconsistent with Social Impact Theory). In a follow up study, a camera was used to record the participant's activity in order to provide an accurate measure of proximity of other shoppers to the participant in the aisle. Results demonstrated that the influence of social presence was greater the nearer the "presence" was to the participant. In another study of social presence that could arguably be interpreted in the same "social strength" framework, Walker et al. (2014) demonstrated that individuals used more fillers ('um's and 'uh's) during a question and answer task when they were asked questions by a human (and who was therefore present in the room with them) relative to when they were asked questions by a computer. Critically, this difference persisted, but was reduced, when another person was "merely present" in the room. Thus, use of fillers (argued to be a "face saving" act; Smith & Clark, 1993) increases as the immediacy of the social interaction increases (e.g., answering questions posed by a person > answering questions with a person present > answering questions alone). Thus, the Argo et al. (2005) and Walker et al. (2014) work provide some evidence that Latane's (1981) notions of social strength modulate the influence of social presence on behavior.

### 1.3 Implied social presence

As reviewed above, the actual physical presence of another individual can have profound effects on performance and behavior in rather complex settings. Interestingly, the physical presence of another person is not always necessary for such effects to emerge; rather a simple reminder or cue (e.g., a camera) suggesting that one *might* be watched is sufficient to induce effects similar to when someone is physically present (Bateson, Nettle & Roberts, 2006). In the following I briefly review research on implied social presence effects before turning back to the influence of social presence on attention.

The earliest work to directly investigate implied social presence effects was reported by Putz (1975; but see also Wicklund and Duval, 1971). Putz examined responses to a low complexity task under different supervision situations: direct supervision by an individual, a closed circuit television (CCTV) recording, a one-way window, and a no supervision condition. His findings demonstrated that participants performed better on the cognitive task under all of the three supervision conditions with no significant difference between the physical presence condition and the other two implied social presence conditions. This established strong evidence that whether a presence is real or implied, the effect of social presence is robust.

Like work on actual social presence, research has revealed that an implied social presence increases conformance to social norms. For example, Van Rompay, Vonk, and Fransen (2009) demonstrated that people were more likely to help to collect a pile of questionnaires that were dropped by a confederate in a lab when there was a security camera in the room, compared to no security camera present. In addition, this effect was moderated by individual differences in social desirability (i.e., those higher in social desirability were more influenced by the presence of a security camera than individuals low in social desirability).

Even more subtle cues of implied presence, such as eye-like images, have also been proven to be sufficient to increase prosocial behaviour (Ernest-Jones et al., 2011; Nettle et al. 2013). Bateson, Nettle, and Roberts (2006) reported that a simple image of a pair of eyes significantly increased donations to an honesty box system meant to collect money for drinks in a shared coffee room. Similar studies have found that people are more likely to clean up cafeteria litter or garbage at a bus stop when eyes are present (Ernest-Jones et al., 2011; Francey & Bergmuller, 2012), and they will even donate more to charities (Nettle et al., 2013; Powell et al., 2012) although there has been a recent meta-analysis (Northover, Pedersen, Cohen, & Andrews, 2017) that finds a lack of reproducibility for the generosity effect of artificial presence cues. For example, Powell et al. (2012) conducted an 11-week field experiment in a supermarket, where they displayed eye images on charity collection buckets that were set up at the check-out locations. Their results indicated that the presence of eyes increased charitable donations by 48%, relative to the donations to the control buckets with no eye images. The effect of the eye images was much stronger when the supermarket was less busy, an interesting finding that was replicated by other research using eye cues to study prosocial behaviours. Both Ernest-Jones et al., (2011) and Ekstrom (2012) found that eye images exert the strongest influence on prosocial behaviour when there is less of a real social presence. This could be explained by the fact that when there is a real source of presence it “overrides” the influence of the implied presence cues, in this case the images of eyes.

Apart from external cues to being watched, social presence can also be imagined by an individual, in that a person might imagine that someone else is present watching and evaluating them. For example, in Dahl, Marchand, and Argo (2001) the researchers had an imagined presence version of the condom purchase task. Participants were sent to a condom vending machine within a restroom of a building. They were asked to make the condom purchase and subsequently return

to the experimenters. Upon their return, they reported the thoughts and feelings they had experienced during the task and rated their levels of embarrassment related to the purchase. Participants were also asked to identify what caused the feelings they reported, which was coded for mentions of imagining another person or an audience present while they made the purchase. As in the original version of the experiment, familiarity with the purchase was measured. They found that imagining the presence of others increased participants' ratings of embarrassment, and that familiarity actually reduced the likelihood of imagining an audience (social presence) but familiarity did not interact with participant embarrassment, which was not the case in the real presence study (where familiarity decreased embarrassment).

#### **1.4 Real vs. Implied Presence**

The question of real presence being the same as implied presence or imagined presence has two probable answers. There is an ample amount of evidence that the simple physical presence of a conspecific can change behaviour of another individual in many, often quite drastic, ways. Given this knowledge, it could be said that since the presence of someone is such a big factor, implied presence without the actual physical presence of someone could in no way be the same. Put differently, if one were to propose that a fundamental defining aspect to a social presence effect is precisely that another person has to be socially (i.e., physically) present, then by definition an implied social presence effect cannot be the equivalent to a social presence effect.

On the other hand, one could make the counter-case that if the presence of someone is so extremely important and influential on another's behaviour, then even the mere suggestion that someone else is present may be sufficient to elicit behaviours comparable to physical social presence. After all, our interactions with other people are often based on stimuli that serve as

powerful proxies for our actual presence - for example, by writing a letter or texting another person - and therefore it may be the case that physical presence is merely one of many ways to elicit a social presence effect. Indeed, as early as 1975, Putz was using CCTV technology and one-way mirrors to demonstrate that people may be influenced in similar ways as with physical presence when they perform simple cognitive tasks. And in his work on Social Impact Theory (SIT), Latane (1981) describes the influence of social context on an individual's behavior and sets out mathematical equations to predict how specific social situations impact behaviour. In his descriptions of SIT, he suggests that people would be impacted by real or even imagined presence, although does not specify if they would be important to the same degree or not.

In summary, people routinely act on objects and events in the world that are proxies for something else, and as such they do not need the actual item in order to represent its existence or anticipate its impact. Accordingly, anticipating certain emotional outcomes has been documented to change how people behave in the present (Baumeister, Vohs, DeWall & Zhang, 2007), it has also been demonstrated that imagining certain situations may elicit the sensation of a variety of emotions (Ochsner & Gross, 2005), and even imagining food will increase salivation in individuals (White, 1978). Therefore, the argument for an imagined or implied social presence influencing behaviour is strong, which is in line with what has recently been reported in the literature. Very simple cues of being watched, such as the use of eye images (Powell, Roberts & Nettle, 2012) or a camera in the room (Van Rompay et al., 2009) have been shown to evoke social presence effects.

There are clearly many similarities in the effects of actual and implied social presence. Both can improve behavior in simple tasks (Pessin & Husband, 1933; Putz, 1975), both appear to increase conformance to social norms (Baumeister, 1982; Rompay, Vonk & Fransen, 2008) and both are moderated by individual differences in sensitivity to such conformance (e.g., individual

differences in impression management; Uziel, 2007). More direct evidence for a shared mechanism can be found in work by Powell et al., (2012; see also Ekstrom, 2012) where they demonstrated that an implied social presence (eyes) has “less” of an impact relative to the control condition when there was a greater amount of actual social presence (i.e., other people around the checkout). Thus, the two effects may not be as additive as would be predicted on the account that they reflect two independent effects on behavior. In another direct comparison, Dahl et al. (2001) did find what could be an important difference between the influence of actual and imagined social presence. Specifically, with real presence they found that familiarity with the embarrassing purchase decreased embarrassment, whereas with implied presence task familiarity did not interact with measures of embarrassment. While it was unclear what could be responsible for the different influence of task familiarity across the different types of social presence, it seems clear that research adopting designs like those in Powell et al. (2012) and Dahl et al. (2001) would help greatly in understanding the mechanisms underlying implied and actual social presence effects.

While actual and implied social presence effects might be similar *qualitatively*, there seems to be an intuitive notion that they might differ *quantitatively*. In particular, an implied source of presence might be viewed as a weaker or more transient effect than a real physical presence. This could be conceptualized theoretically in terms of the “proximity” or “immediacy” of the social presence (as discussed above). For example, one could argue that an implied social presence is not as strong as a real presence, given that implied presence is an indirect source/cue of being monitored. Interestingly, the limited number of direct comparisons do not seem to support this notion. For example, when Putz (1975) compared direct supervision by an individual to CCTV recording, there was no difference in the amount of social facilitation relative to baseline. In addition, in Powell et al., (2012) the difference between no eyes and eyes near a donation box had

a larger influence on charitable behavior than the number of actual individuals present. Thus, at least with the available evidence (which is not much), the magnitude of actual presence effects do not seem to be larger than the magnitude of implied social presence effects.

### **1.5 Gaze and social presence**

In order to purposefully quantify and capture differences between real and implied presence, there is a need for an appropriate metric that will allow for meaningful comparisons. Eye movements are an ideal objective measure to capture such behavioral differences. We use our eyes to collect information and communicate with others – and with the review of social presence effects, it seems reasonable to suggest that the real or implied presence of others might impact one's looking behavior. In addition, this influence should take the form of gazing in a manner that conforms more to social norms when in the real or implied presence of another. While the research demonstrating that individuals' gaze behavior changes in response to the actual presence of others can be interpreted as consistent with this idea (e.g., Laidlaw et al., 2011; Gallup et al. 2012), these were not direct tests of the hypothesis that social presence will produce gaze behaviors that are more socially normative (i.e., the “social norm” in each case being to some extent unclear a priori). In addition, this work focused on actual presence rather than implied social presence. Below I review work directly addressing the hypothesis that an implied social presence increases socially normative looking behaviour.

Risko and Kingstone (2011) generated the speculative hypothesis that one's awareness of gaze as a signal, combined with the desire to adhere to social norms, might lead people to change their looking behavior when they are aware that their eyes are being monitored. In other words, simply wearing an eye tracker might be sufficient to imply the presence of another individual and

alter overt attention. Eye trackers provide a moment-to-moment record of where an individual is looking, and given the importance of the eyes as a communicative tool, it might serve as a particularly powerful form of implied social presence.

To test the idea that wearing an eye tracker might serve as an implied social presence and influence looking behavior, Risko and Kingstone (2011) compared looking behavior when individuals knew their eyes were being watched (via an eye tracker) against when they did not know that their eyes were being watched. In all instances, looks were actually recorded using a hidden camera. Participants took part in a natural looking task in which they performed a simple computer task alone in a testing room that contained objects typically found in an office. In addition, Risko and Kingstone mounted a provocative sexy swimsuit calendar in the testing room. After completing the computer task, participants remained alone in the room for 1 minute. It was participants' looking behavior to the calendar during this free time that was of interest. They predicted that if social presence influences looking behavior, then individuals should alter their behavior to be consistent with social norms when wearing an eye tracker, such that they should be less likely to look at the sexy calendar than individuals not wearing an eye tracker. The results were clear cut. Participants wearing an eye tracker were much less likely to look at a provocative stimulus than individuals not wearing an eye tracker. An additional group who wore the eye tracker but were told it was not recording behaved based on whether they believed that their eyes were actually being tracked or not: they avoided looking at the calendar when they believed that their eyes were being monitored, and they looked at the calendar when they believed their eyes were not being monitored by the eye tracker.

Theoretically, this study suggests that eye trackers can serve as an implied social presence. Whether participants looked at the sexy calendar or not depended on whether they believed that

their looking behavior was being monitored. If they felt that their eyes were being watched, they avoided looking at the calendar, in accordance with the prosocial norm that discourages objectifying women by staring at their bodies. In contrast, if participants felt that their eyes were not being monitored, and therefore their looks at the calendar would not be seen by anyone else, and hence not reflect poorly on them, then they were all too willing to look at the calendar. It is important to note that there is no interaction of gender in these findings, although males and females may be driven to look at the sexy calendar for different reasons. For instance, women are more likely to engage in social comparison (Strahan et al., 2006) and spend more time looking at same sex figures when presented with erotic photographs (Rupp & Wallen, 2007).

While the Risko and Kingstone (2011) study clearly demonstrates that what we attend to is influenced by an implied social presence, much work remains to be done. Establishing this effect as a genuine social presence effect, for example, could be strengthened by demonstrating that individual differences in impression management moderate the influence of wearing an eye tracker on gaze. This work also highlights potential ways forward with respect to understanding social presence effects in general. For example, with respect to directly comparing actual with implied social presence, the paradigm developed by Risko and Kingstone (2011) can readily be adapted to compare overt attention across types of social presence.

## **1.6 Outstanding questions in social presence**

This section outlines some of the outstanding questions that remain with regards to our current state of knowledge and what might be potential factors in social presence effects. For the sake of clarity, what we know about these variables in terms of real and implied presence is

summarized in the table below:

VARIABLES	REAL PRESENCE	IMPLIED PRESENCE
<b>Impression Management/Need for approval</b>	Higher ratings for impression management increase presence effects for probability to donate and increase variety seeking behaviour	Higher ratings of need for approval increase presence effects on helping behaviour
<b>Self-awareness</b>	<i>Inconclusive:</i> Presence of others increases self-awareness ratings but how this interacts with presence to influence behaviour not directly tested	<i>Inconclusive:</i> Self-awareness linked to performance on a task but manipulation is questionable (camera pointed at individual vs. camera pointed away)
<b>Familiarity</b>	High familiarity will decrease embarrassment ratings in presence situations. Increases reported likelihood to use a coupon in presence of others	<i>Inconclusive:</i> Familiarity reduces imagining an audience but does not bring about any influence on purchase decisions as in real presence conditions
<b>Proximity</b>	Closer proximity of real presence source influences purchase choices	<i>Unknown</i>
<b>Number of Sources</b>	<i>Inconclusive:</i> Found to	

<b>Present</b>	influence reported emotions but not behaviour in terms of presence effects	<i>Unknown</i>
<b>Type of presence</b>	Presence of family members vs. peers can change how social presence influences impulsive purchase choices	One way mirror and camera seems to influence behaviour in the same way for the same measure
<b>Individual Differences</b>	<i>Inconclusive:</i> Personality measures noted as an important factor but evidence is based on flawed methodology	<i>Unknown</i>
<b>Culture</b>	<i>Unknown</i>	<i>Unknown</i>

Real and implied presence evidently influences behaviour. A review of the literature uncovers some direct comparisons of real versus implied presence effects, but questions of how the effects directly compare remain unanswered. One important consideration outlined by Latane (1981) and confirmed by the results of Argo et al., (2005) is the question of social proximity on the social presence effect. One could argue that if implied presence is not as strong as real presence, given that implied presence is an indirect source/cue of being monitored, then the proximity required to trigger an implied social presence might be nearer than real presence. In other words, does an implied presence source need to be closer in proximity to the individual when compared to a real presence source, to influence behaviour?

Building on this, there is the interesting finding that real presence seems to override implied presence, suggesting that implied presence works best and is strongest when fewer people are in the environment (Ekstrom, 2012; Powell et al., 2012), although precisely why this interaction arises remains unaddressed. Latane (1981) suggests that the effect of real presence changes (e.g., increases) with the number of people present. Similarly, Argo et al., (2005) examined if the size of social presence changes with the number of people in the aisles but the results were inconclusive. Fluctuations in the number of people present influenced the emotions reported by participants, but it did not influence their actual behaviour.

How the factors of proximity and size combine and vary between real and implied presence remains to be teased apart, as well as how a real source of presence might interact with an implied presence source when both are introduced into an environment (e.g., must a real source of presence always reduce the impact of an implied presence?).

The role of individual differences is another factor that has not been thoroughly investigated. Uziel (2007) outlines some evidence that suggests personality differences (especially neuroticism, self-esteem, and extraversion) can account for some of the variations in real social presence effects, but most of the examples are drawn from studies where a baseline condition was lacking, and therefore the results are equivocal. Although an individual's need for approval has been noted and measured as a mediating variable in a handful of past studies (Van Rompay et al., 2009) as well as impression management being linked to the strength of the influence of social presence (Argo et al., 2005), there is a lack of consistency in how need for approval and impression management were measured across the studies. Many of the studies also simply infer impression management and need for approval to be mediating variables rather than actually measuring them. An impression management scale (Paulhus, 1986) could be included to measure how implied

presence and real presence vary depending on an individuals' ranking on such a scale. Furthermore, distinct personality types might be more susceptible to impression management and need for approval, hence understanding what personality types are more influenced by social presence can further our knowledge of individual differences that magnify or mitigate social presence effects.

Building upon individual differences, there are also questions one could ask about cultural background and how collectivistic and individualistic cultures might be differently impacted by social presence. Ratner and Kahn (2002) suggest that collectivistic and individualistic cultures exhibit different levels of impression management, conformance to norms, and self-monitoring. It is suggested that East Asian cultures are unceasingly self-aware, for instance Japanese culture has a distinct word for this, "Seiken", which means how one appears to society or how the 'gaze' of society is upon the individual (McVeigh, 2002). There is a general acceptance in cultural psychology research that there is heightened awareness of evaluation from others in collectivist societies, meaning people are more aware of how they appear to others when compared to North American individualistic societies (Heine, Takemoto, Moshkalenko, Lasaleta & Heinrich, 2008). Heine et al. conducted a study looking at how the presence of a mirror (a mirror having been established to activate self-awareness) influences self-critical behaviour and cheating behaviours. They found that North Americans are significantly affected by a mirror in the room, whereas Japanese participants are not. North American participants significantly decrease cheating rates on a task and increase self-criticism levels when in the presence of a mirror. The lack of an effect for Japanese participants is explained in terms of Japanese individuals chronically considering how they look to others since they are constantly monitoring themselves (whether in the presence of a mirror or not). In contrast, North American participants, who are, putatively, not usually self-

aware, there was a strong effect of self-awareness triggered by the mirror. These findings suggest the somewhat counter-intuitive prediction that individualistic cultures would be more susceptible to the influences of social presence, given that key factors such as impression management and self-monitoring may tend to decline profoundly when these individuals are alone and only come into play when real or implied presence of others is introduced.

In the same vein, in-group and out-group associations could influence social presence effects. As noted by Ernest-Jones et al. (2011), the effects of the presence of others are likely to be greater when the group to which they belong (e.g., peers or family) is cohesive than when it is less so. Group cohesiveness (i.e., the attractiveness of the group to its members; Forsyth, 2000) is likely to induce a clearer normative expectation as well as increase the motivation to comply with it. This leads to the prediction of a stronger influence of social presence within an in-group context, but to date this possibility has not been investigated.

There are also questions remaining with regards to the influences of social presence on impulsive purchasing and coupon use. There are noted limitations related to the scenario-based studies conducted by Luo (2005) and Ashworth et al. (2005), where they investigated the hypothetical influence of social presence on impulsive purchasing behaviour and coupon use respectively. It would be interesting to see if a more real life setting would replicate the reported results, as well as a follow up using an implied presence source to see if similar effects emerge.

In terms of understanding which mechanisms are shared with regards to real and implied presence, few studies have included measurements of arousal, nor are there any studies that have addressed attentional mechanisms. A few of the eye image studies have ruled out any increase in attention towards the actual stimuli of eye images by measuring the amount of attention participants pay to the eye images (Ernest-Jones et al., 2011; Francey & Bergmuller, 2012) but

none have looked at attention to the task itself or the impact of different attentional resources being available to regulate or monitor one's own behaviour. With regard to the latter, given that it is a lot of work for individuals to monitor themselves for what is appropriate behaviour or not (Ward & Mann, 2000), it naturally follows that the higher the cognitive load from the task the less individuals can monitor themselves and inhibit their natural responses.

Argo et al., (2005) do discuss that there is the need to explore the differences that may exist between real versus implied presence, and suggest that research developing an experimental design that is amenable to both forms of presence would be a significant theoretical and empirical advance, as it would enable direct tests to be made between the two forms of presence. In sum, while there is a sense that real and implied social presence are similar, but not identical, determining precisely *how* they are the same and different, and *why* any overlaps and divisions exist, has been limited by the failure to establish a common metric for measuring the effects of presence across real and implied situations. In other words, when a meaningful comparison in the table above can be made, it will be because a common measurement has been used. However, different variables often have different performance measures, which has limited the ability to make direct comparisons between factors. Thus, substantial progress might be made if a common metric were in place that enables direct comparisons across real and implied social presence, and the variables of interest.

Attention is a well-understood measure that provides the opportunity to address this limitation. As previously mentioned, visual attention is very sensitive to changes in situational context, and it has recently been demonstrated that looking behaviour, an overt measure of visual attention, is extremely responsive to real and implied social presence. For instance, the way people look at a person's face changes dramatically when that person is physically present compared to

when that person's image is displayed to a participant in a video (e.g., Laidlaw, Foulsham, Kuhn & Kingstone, 2011). Similarly, when implied social presence is established by introducing a camera that can monitor looking behaviour, then individuals will adopt a looking behaviour that reflects positively on themselves, e.g., by avoiding looking at a sexy swimsuit calendar mounted on a wall (Risko and Kingstone, 2011; Nasiopoulos et al. 2015).

## **1.7 Thesis Overview**

In the following chapters, experiments are presented that aim to better understand the effect of implied social presence, the boundaries of implied and real social presence, as well as direct comparisons between the two types of social presence across a series of variables: visual attention allocation (including fixations and dwell time), individual differences in terms of personality characteristics and impression management, and even decision making for purchasing choice scenarios. Chapter 2, Study 1, investigates if an implied social presence effect changes over time; that is, if it is a transient effect or if it is sustained over time. Study 2 investigates how self-awareness, which is highlighted in the literature to be a potentially important factor for social presence effects, might drive the influence of social presence. In Chapter 3, Study 3, I move on to investigating how social presence, both real and implied, may influence looking behaviour towards provocative stimuli. After capturing the basic effects of social presence on eye movements, Study 4, introduces a refined paradigm for studying the effect of presence on eye movements. Chapter 4, Study 5, manipulates cognitive load, testing how attentional mechanisms may be involved in social presence effects. Study 6 manipulates proximity of social presence in order to better understand the boundary effects of social presence. Chapter 5, Study 7, investigates if the effect of real and

implied social presence generalizes to complex decision making situations in a paradigm that closely simulates real-world online purchases. Chapter 6, reviews the main findings of this thesis, its methodological, empirical, and theoretical contributions and limitations, and finally, its implications for future lines of research.

## Chapter 2

### 2.1 Study 1: Sustained versus transient implied social presence effects

As reviewed in Chapter 1, it is established that the physical presence of others elevates conformance to social norms, which reflects one's need to attain approval or avoid the disapproval of others (Guerin, 1986). Social presence effects, however, extend beyond the physical presence of others. For example, security cameras, which imply the presence of others, increase prosocial behaviours, with individuals being more likely to provide help to others in a public setting (Van Rompay, Vonk, & Fransen, 2009).

The influence of an implied social presence has recently been extended to the domain of visual attention vis-a-vis eye tracking (Risko & Kingstone, 2011). One of the working assumptions underlying eye tracking research is that typical looking behaviour is unaffected by wearing the eye tracker and the knowledge that one's eyes are being monitored. It was surprising then when Risko and Kingstone (2011) discovered that looking behaviour is affected by wearing an eye tracker. When provided with the opportunity to look at a sexy swimsuit calendar mounted on a wall, the vast majority of participants chose not to do so if their eyes were being monitored. However, if participants believed that the eye tracker was turned off, or if they were not wearing an eye tracker at all, then they looked at the swimsuit calendar. In short, participants change their looking behaviour when they know or believe that their eye movements are being recorded by an eye tracker. The eye tracker functions as an implied social presence that leads individuals to adjust their looking behaviour in a prosocial manner.

Whether eye tracker-induced social presence exerts a sustained strong effect or a transient weak effect touches on the methodological and theoretical implications of the phenomenon.

Methodologically, determining the relative strength of the effect can inform research decisions. Theoretically, determining the relative strength of the eye tracker-induced social presence effect will lay the foundation for comparison to social presence effects induced by other means, ranging from surveillance cameras to the very belief in the presence of supernatural watchers (Shariff & Norenzayan, 2007), and it will also provide important clues as to the mechanisms underlying these effects (e.g., Crosby, Monin, & Richardson, 2008; Dale & Vinson, 2013).

To my knowledge, there is no experimental work systematically investigating the extent to which a given social presence effect, once induced, can be reduced or even eliminated, and certainly no work on this issue in the context of eye tracker-induced social presence effects. Legitimate cases can be made for both the sustained and transient presence hypotheses. In favour of the sustained hypothesis, there exists solid and converging evidence that the eyes represent a critical social stimulus (Birmingham & Kingstone, 2009; Risko, Laidlaw, Freeth, Foulsham, & Kingstone, 2012). Thus, prolonged monitoring of the eyes could be expected to induce a durable form of social presence. In a similar vein, social presence effects in general might be expected to be relatively durable, given the amount of time individuals spend in social settings. These data converge on the prediction that when an eye tracker is present, prosocial looking behaviour will be the norm. Only knowledge that one's eyes are not being watched (e.g., removal of the eye tracker) will yield looking behaviour that is deviant from the prosocial norm (e.g., people will look at the sexy calendar). I call this "natural looking behaviour", in that participants are doing what they would naturally do when they do not feel like their eyes are being watched. On the other hand, eye tracking is both novel to most individuals and designed to be non-invasive. Both of these features could lead individuals wearing an eye tracker, with time or distraction, to revert to a state akin to when their eyes were not being monitored, thus leading them to a more natural pattern of

looking. In this case, the eye tracker-induced social presence effect would represent a transient social presence effect in the sense that its influence diminishes despite the continued presence of the eye tracker.

### **2.1.1 Method**

*Participants.* A total of 83 participants (59 women and 23 men), ranging in age from 18 to 51 years, volunteered. Participation was contingent on normal or corrected vision (contacts), and resulted in \$5 payment or course credit. Participants provided consent, and although deception was necessary for the study, they were debriefed and the true purpose of the study was explained when they completed the experiment. Participants had the option to withdraw their data (the hidden video recording and all other data) if they chose to do so.

*Materials.* An ASL MobileEye was used for eye tracking, which consists of a head mounted system with the glasses connected to a digital video recorder that records information about the eye and the scene. A pinhole camera (indiscernible from the distance participants were seated at) was hidden behind the provocative stimulus at a 90° angle to the right of where participants sat for the computer task. See Figure 2.1 for an example of the set up.

*Procedure.* The modified task involved four phases. In the first phase, participants took part in an easy and engaging task outside the laboratory, searching a building for coloured items mounted on the walls (phase 1). The second and third phases constitute a direct replication of Risko and Kingstone (2011). Participants were placed in a room with a sexy swimsuit calendar (with only female models depicted) on the wall and were asked to complete a simple computer-based task (phase 2) followed by 1 min of “free time”, while they waited to be retrieved by the

experimenter (phase 3). The critical manipulation involved if and when an eye tracker was worn.

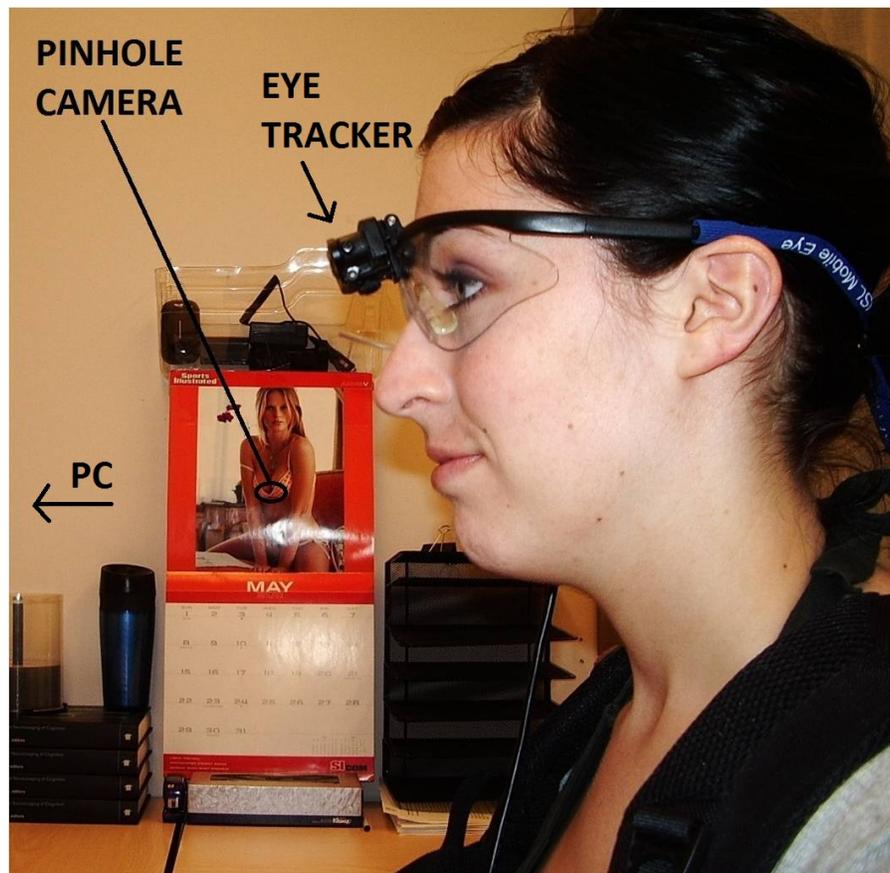
There were four groups. In the *no eye tracker group*, the participant did not wear an eye tracker during any phase of the experiment. This represents the natural looking group and it was expected participants would look at the calendar during phase 3. In the *standard eye tracker group*, participants wore an eye tracker during the second and third phases of the experiment. This replicates Risko and Kingstone (2011), and participants were expected to avoid looking at the calendar. In the *all phases, eye tracker group* participants wore the eye tracker during phases 1 through 3. Thus, participants in the *all phases group* had more time to wear the eye tracker and a more varied set of experiences (including experience outside the laboratory) wearing the eye tracker both of which could lead to individuals (if possible) behaving as if the eye tracker was no longer present. According to the sustained presence hypothesis, the all-phases group should behave like the standard group, whereas according to the transient presence hypothesis, the all-phases group should behave like the no eye tracker group. The fourth group, the *recalibration group*, participants wore the eye tracker for all 3 phases, but I added a second calibration between phases 1 and 2. If the social presence effect is found to be transient, then the recalibration group will reveal whether the device has been habituated to or not. If the participant has habituated to the device – defined as a decrease in responsiveness upon repeated (continuous) exposure to the eye tracker – then drawing participants' attention back to the eye tracker should have little effect (e.g., they have ceased to care about it). On the other hand, if the transient effect reflects participants simply shifting attention away from the tracker, then the social presence effect should be easily reactivated by a simple reminder that their eye movements are being recorded by the tracker.

Participants read and signed a consent form before the study. In the *all phases eye tracker group and the recalibration group*, participants were fitted with the eye tracker and a calibration

was conducted in the laboratory. Participants were told that they would have their eyes tracked and were aware of the moment that recording began. Participants then commenced the ‘counting colours task’, which involved walking freely on a specific level of a campus building and searching for and counting coloured squares that were posted on the walls in various locations. These squares were either blue or green and participants were given 2.5 min to count squares belonging to one of the two colours and another 2.5 min counting the other coloured squares. The experimenter accompanied them into the halls while keeping time. Participants were told that they would be reporting how many squares they remembered counting for each colour. In the *standard eye tracker group*, the *no eye tracker group*, the *all phases eye tracker group* and the *recalibration group*, participants completed the same 5-min task without the eye tracker. Upon completion of the *counting colours* task, participants were directed to the laboratory, where they wrote down the number of squares they remembered counting. All participants found this task simple and straightforward and performed it nearly flawlessly.

After the counting colour task, participants in the *recalibration group* did a second calibration of the eye tracker, and the participants in the *standard eye tracker group* were fitted with the mobile eye tracking device and the calibration was conducted. All participants then proceeded to perform a computer-based task. This filler task was an exact replication of the Risko and Kingstone (2011) original task, where participants were asked to complete a 6-min cueing experiment (Frischen et al., 2007) alone in a room on a computer. In this room, the provocative stimulus was 90° to the right of the participant. All other contents of the room were held constant across conditions, and the room resembled a typical graduate student office setting with two desks, textbooks, a desktop computer and filing cabinets. Within the swimsuit calendar, a wireless pinhole camera was hidden to record participant's looking behaviour. Participants were given

instructions for the cueing task and told to wait for the experimenter when they had finished the task. The experimenter was able to observe participants through the hidden camera feed, and once the sham cueing experiment was over, participants were left in the room for 1 min, while their gaze behaviour towards the calendar was recorded. Once this critical minute had elapsed, the experimenter returned, removed the tracker (if worn), and debriefed the participants.



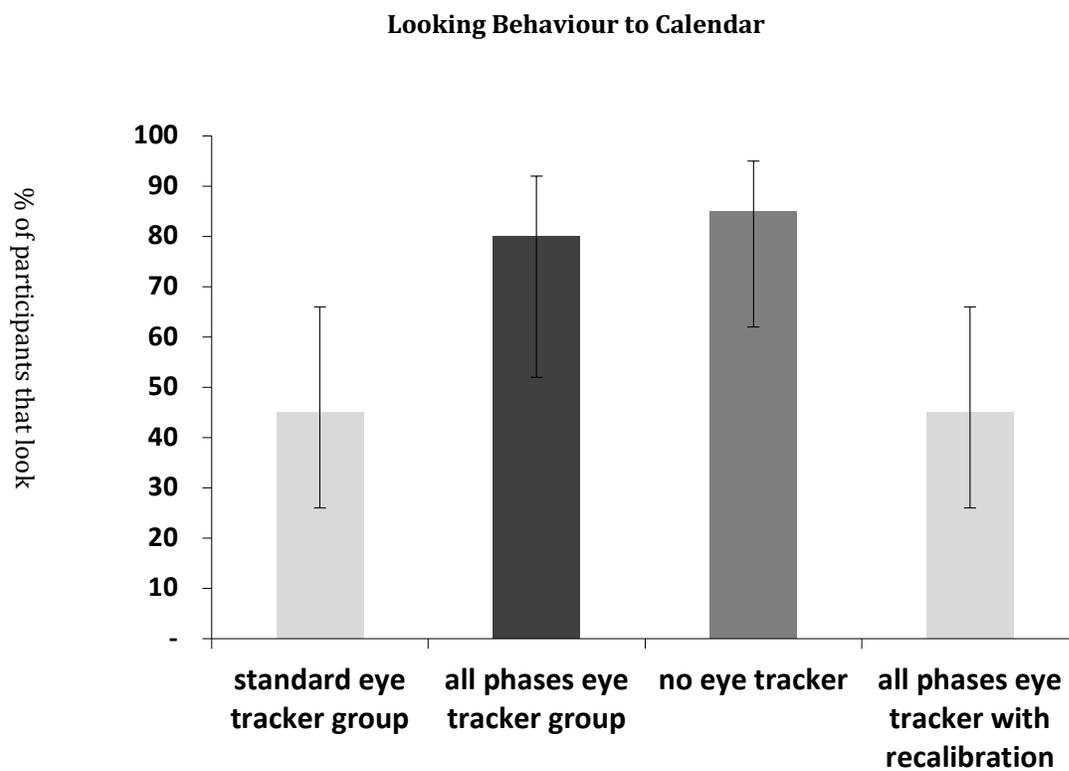
**Figure 2.1** A visual depicting the seated position of the participant, the eye tracker and the main stimulus of the swimsuit calendar with the pinhole camera embedded within.

### 2.1.2 Results

The key 1-min video clips were coded for looking behaviour. Two raters, naïve to the conditions of the clips, coded for direct looks towards the calendar. Agreement on whether

participants looked at the calendar was perfect between the raters,  $K = 1.0$ ,  $p < .001$ , leading to no loss of participant data. The total sample size consisted of 82 participants.

Chi-squared analysis with one degree of freedom ( $df = 1$ ) was used to compare the frequency of people in each group who looked towards the calendar (see Figure 2.2). As in Risko and Kingstone (2011), participants were more likely to look at the provocative stimulus in the *no eye tracker group* (85%) than in the *standard eye tracking group* (45%). This difference was significant,  $\chi^2 = 7.29$ ,  $p = .007$ . Critically, participants in the *all phases eye tracker group* were as likely to look at the provocative stimulus (80%) as participants in the *no eye tracker group*  $\chi^2 = 0.12$ ,  $p = .732$ , and were significantly more likely to look at the provocative stimulus than participants in the *standard eye tracking group*,  $\chi^2 = 5.94$ ,  $p = .015$ . This shows that the effect of wearing an eye tracker is transient. In the light of this finding, the results for the *recalibration group* are especially informative. Our data reveal that these participants, who wore an eye tracker throughout all phases of the study, but received a recalibration condition just before the computer task, reverted back to a performance level that is identical to the *standard eye tracking group* (45%),  $\chi^2 = 0.00$ ,  $p = .976$ . Accordingly, participants in the recalibration group were less likely to look at the calendar than participants in the *all phases group* and the *no eye tracker group*,  $\chi^2 = 5.30$ ,  $p = .02$ , and  $\chi^2 = 7.136$ ,  $p = .008$ , respectively.



**Figure 2.2** Percentage of participants who looked at the provocative stimulus as a function of group. Error bars indicate the lower and upper limits of the 95% Confidence Interval for a proportion.

### 2.1.3 Discussion

The aim of this study was to address what would happen to looking behavior when exposure to an implied social presence was sustained for a prolonged period of time. The study reveals that on the very first wearing of an eye tracker, and in less than 10 min, the implied presence effect of an eye tracker is abolished, but by drawing attention back to the eye tracker, the implied presence effect is easily reactivated. This suggests that eye trackers induce a transient social presence effect, which is rendered dormant when attention is shifted away from the source of implied presence.

Participants who wear an eye tracker during an initial colour counting task (*all phases group*) look at the calendar in a manner similar to those that never wear an eye tracker. These data are consistent with the eye tracker inducing a transient social presence effect in the sense that its influence dissipates rapidly without removing the inducing stimulus. This can be contrasted with what we termed a sustainable presence effect wherein the behavioural influence of social presence (i.e., the inducing stimulus) remains as long as the inducer is present. Furthermore, results from the *recalibration group* demonstrate that a simple reminder of the eye tracker (i.e., a recalibration) is sufficient to re-induce the prosocial looking behaviour.

The results are clear. Replicating Risko and Kingstone (2011), participants tend to look at the calendar when they believe that their eyes are not being monitored (no eye tracker group), and they avoid looking at the calendar when they know that their eyes are being monitored (standard eye tracker group). One new finding is that participants who wear an eye tracker during an initial colour counting task (*all phases group*) look at the calendar in a manner similar to those that never wear an eye tracker. These data are consistent with the eye tracker inducing a transient social presence effect in the sense that its influence dissipates rapidly without removing the inducing stimulus. This can be contrasted with what we termed a sustainable presence effect wherein the

behavioural influence of social presence (i.e., the inducing stimulus) remains as long as the inducer is present. Furthermore, results from the recalibration group demonstrate that a simple reminder of the eye tracker (i.e., a recalibration) is sufficient to re-induce the prosocial looking behaviour. The theoretical and methodological implications of these results are discussed below.

In the present study, taking part in an additional preliminary colour counting task while wearing the eye tracker led to the elimination of the eye tracker-induced social presence effect. The additional task was designed to provide participants with more time wearing the eye tracker, the opportunity to take part in an engaging task while wearing the eye tracker, and time wearing the eye tracker outside the “socially charged” context created by the presence of the provocative stimulus. The ease with which the eye tracker-induced social presence effect was eliminated comes as a surprise. The fleeting nature of the eye tracker-induced social presence effect would seem to suggest that either (1) socially appropriate looking patterns are themselves difficult to monitor and maintain or (2) the eye tracker’s activation of these mechanisms is significant, but vulnerable to habituation as a user becomes accustomed to the device.

Socially appropriate looking patterns (or at least the mechanisms behind them) probably evolved in the context of interacting with real social agents. Eye trackers, of course, are not real social agents. Rather, eye trackers (and other forms of implied social presence; for example, video cameras) indirectly represent other social agents and this fact might be responsible for the fragile nature of the eye tracker-induced social presence effect. Convergent with our findings that the effect is transient is a meta-analysis by Sparks and Barclay (2013) who report that exposure to eye-like images will increase cooperative behaviour (e.g., Ernest-Jones, Nettle, & Bateson, 2011), but only when exposure is for a short period of time (e.g., less than several minutes). Collectively, these data would suggest that the mechanisms underlying implied social presence effects are

vulnerable to habituation, and the power of the eye tracker to induce a social presence effect is quickly drained.

An alternative explanation, however, is that the social presence effects are transient, but the power of the eye tracker to induce a social presence effect is only temporarily inactive. Social presence effects are often attributed to attention shifting from an external (observer) to an internal focus (Carver, 1979; Carver & Scheier, 1981; Duval & Wicklund, 1972; Van Rompay et al., 2009) where this internal focus -- what I will call self-awareness -- leads to impression management for the external observer. In this theoretical context, the additional time and engaging task could be seen as engendering a shift away from this external-internal cycle. If this is the case, drawing attention back to the tracker, for instance by doing a simple recalibration, should be sufficient to retrigger the social presence effect.

The data from the recalibration condition were unequivocal on this issue. When participants received a recalibration of the eye tracker, they reverted to a performance level that was identical to the standard eye tracker condition. In other words, the social presence of the eye tracker was re-instituted and participants again demonstrated a strong tendency to avoid looking at the sexy calendar. Collectively, our data then suggest that the transient social presence effect does not reflect habituation to the eye tracker, rather it reflects a shift in attention away from the external/internal (eye tracker/self-awareness) dynamic cycle.

## **2.2 Study 2: The role of self-awareness**

In Study 1, I found that attention to the eye tracker triggers an implied social presence effect, which results in prosocial behaviour because one is self-aware that one's behaviour is being

watched (i.e., by a camera). Note that critical to this idea is that self-awareness alone is not sufficient to trigger prosocial behaviour but rather the awareness that that one's behaviour is being observed. In other words, it is not merely being self-aware of one's own behaviour, but rather self-aware that something (e.g., a camera) is monitoring one's behaviour and that behaviour might be observed by someone else, i.e., the social presence of another person is implied by the camera. Given the theoretical importance of this point, the aim of Study 2 was to examine if self-awareness alone is sufficient to trigger prosocial behaviour in the basic paradigm used in Risko and Kingstone (2011) and Study 1.

In order to manipulate self-awareness without also introducing the implied presence of another person, I turn to the many studies that successfully increased self-awareness in participants by using mirrors (Carver & Scheier, 1978). Mirrors can have a profound effect on self-awareness, causing individuals to focus more attention to the self rather than having an external focus. Essentially, I am using the mirror in lieu of the eye tracker, but importantly, in doing so I am shifting any attention away from an implied "other" to one's self entirely. If self-awareness alone is sufficient to induce prosocial behaviour in the paradigm used in Study 1, then prosocial behaviour should be evident in the mirror condition. If a mirror fails to have a significant effect on prosocial behaviour, then it lends support to the idea that another person who is monitoring one's behaviour -- whether implied or real -- is the critical core component.

As in Study 1, looking behavior toward a calendar is the key dependent variable. In the present study, a mirror replaced the role of the eye tracker, and will be used to induce an increase in self awareness. Participants' looking behaviour will be recorded in terms of their looks towards the sexy calendar present in the room. To confirm that any change in behaviour toward the calendar has to do specifically with prosocial actions, a second group of participants were tested

with a mirror and a neutral calendar. One expects a mirror to reduce looks to the sexy calendar more than to the neutral calendar, replicating Risko and Kingstone (2011). Finally, a baseline group who had the sexy calendar but no mirror present was also included.

### **2.2.1 Method**

*Participants.* 62 participants (39 females, 23 males), ranging in age from 18 to 26 years, took part in the study for either course credit or payment of \$5. Participation was contingent on normal or corrected vision (contacts). Participants provided consent, and although deception was necessary for the study, they were debriefed and the true purpose of the study was explained when they completed the experiment. Participants had the option to withdraw their data (the hidden video recording and all other data) if they chose to do so.

*Materials.* A provocative stimulus (a sexy swimsuit calendar) or a neutral stimulus (a flower calendar) was used. A large mirror was mounted on the wall for the self-awareness manipulation. Within the calendar stimulus, a wireless pinhole camera was hidden to stream and record participant's looking behaviour to a remotely connected laptop computer.

*Procedure.* Participants would look over the consent form while the experimenter explained that they had to set up the testing room. In order to eliminate suspicion of the mirror and the provocative calendar in the testing space, the experimenter would explain to the participant that they had to switch testing rooms at the last minute. Once the participant signed the consent form the experimenter led the participant to the "new" testing room. The experimenter would express dissatisfaction with the room set up, and would casually move the laptop directly in front of the mirror, and the participant would then be seated. Here the participant would proceed to perform a computer-based task. This task was a 'filler task', which was an exact replication of the Risko and

Kingstone (2011) original study, where participants were asked to complete a 6-min cueing experiment (Frischen, Bayliss, & Tipper, 2007) alone in a room on a computer. In this room, the provocative stimulus (a sexy swimsuit calendar) or a neutral stimulus (a flower calendar) was 90° to the right of the participant (see *fig. 2.1* for calendar images). Directly in front of where the participant sat was the mirror (self-awareness manipulation) or no mirror (control condition). All other contents of the room were held constant across conditions, and the room resembled a typical graduate student office setting with two desks, textbooks, a desktop computer and filing cabinets. Within the calendar stimulus, a wireless pinhole camera was hidden to record participant's looking behaviour. Participants were given instructions for the cueing task and told to wait for the experimenter when they had finished the task. The experimenter was able to observe participants via the feed from the hidden camera, and once the filler experiment was over, participants were left in the room for 1 min, while their gaze behaviour towards the calendar was recorded. Once this critical minute had elapsed, the experimenter returned to the testing room, and participants subsequently completed a set of questionnaires.

There were a number of questionnaires given to participants: a background information questionnaire, the Current Thoughts Scale (Heatherton & Polivy, 1991), and the Narcissistic Personality Inventory (Ames, Rose, & Anderson, 2006; Raskin & Terry, 1988). Three different types of self esteem were measured (general, social, and appearance) via the current thoughts scale, as self-awareness manipulations have been shown to be influenced by individuals' self esteem levels. For similar reasons, the narcissism measure was included.

**Figure 2.3 Images have been removed due to copyright restrictions. The depiction of the calendar stimuli that were used in study 1 were that of a swimsuit calendar with an image of a provocative stimulus of a model with minimal clothing, whereas the neutral calendar depicted images of plants and flowers.**

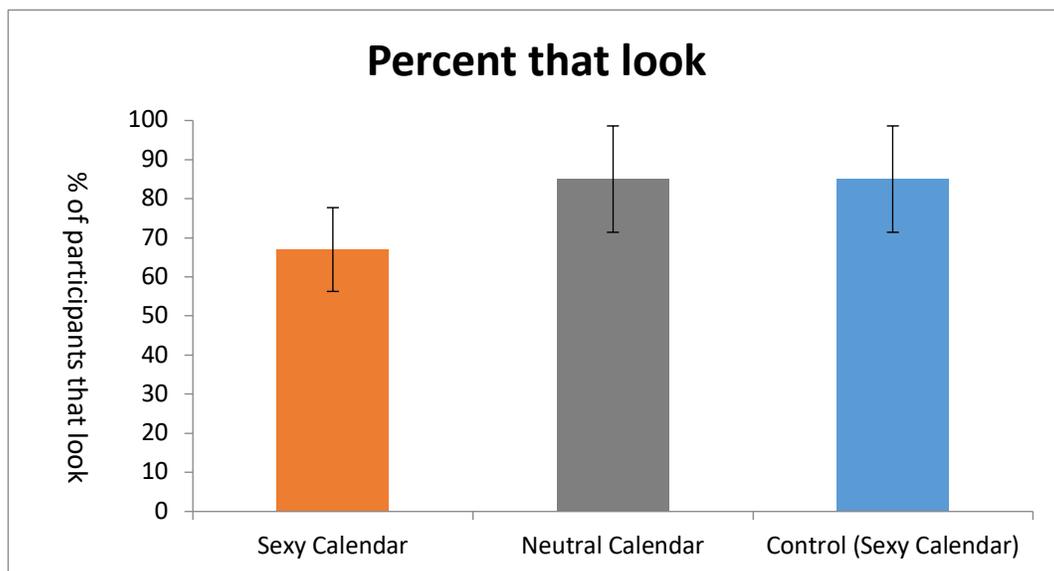
### 2.2.2 Results

One-minute videos were coded for the presence or absence of a direct look to the calendar (camera). A pinhole camera hidden behind the calendar recorded this looking behaviour and two raters who were naive to the study coded the one-minute video clips. There was a strong degree of reliability between coders: Cronbach's alpha = 0.938,  $p < 0.50$ . Two participants were removed due to coding disagreement between the coders.

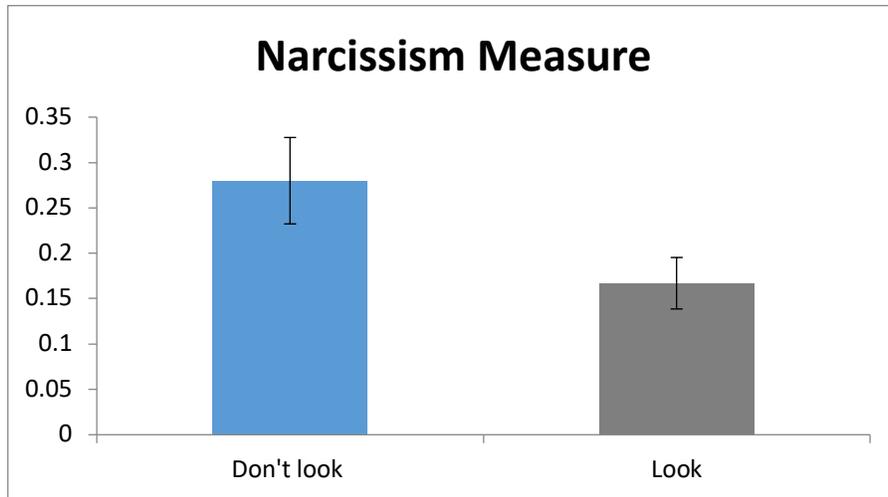
A chi-squared analysis with one degree of freedom ( $df=1$ ) was used to compare the number of participants in each condition that looked toward the calendar. In the *provocative calendar mirror* condition, 63.6% of the participants looked at the sexy calendar, whereas in the *neutral calendar mirror* condition, 85% of the participants looked towards the flower calendar. This difference was not statistically significant  $X^2 = 1.601$ ,  $p = 0.206$ . Similarly, when compared to the control condition, a sexy calendar with no mirror in the room, there were no significant difference in looking behavior between this control (85% looks) and the provocative mirror calendar condition  $X^2 = 2.437$   $p = .116$  or control and the neutral calendar mirror  $X^2 = .173$   $p = .677$ . In sum, the mirror had no reliable effect on overall looking performance as illustrated in Figure 2.4.

In terms of the questionnaire responses, as shown in Figure 2.5, it was found that individuals who did not look toward the calendars in the mirror condition scored higher on the Narcissistic Personality Inventory  $F = 6.677$ ,  $p = .036$ , but with no main effect of General Self

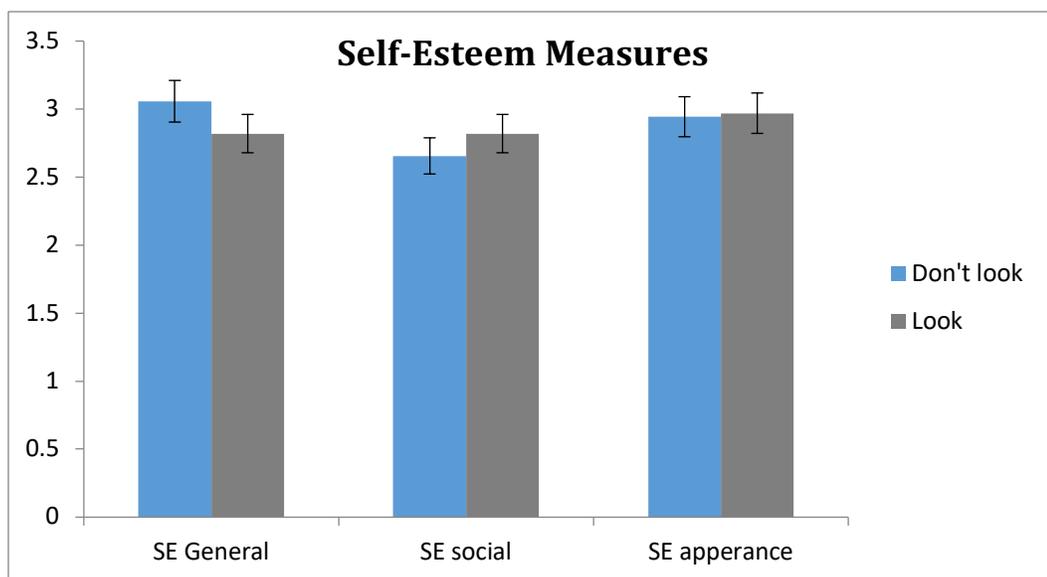
Esteem  $F=.333$ ,  $p=.94$ , Social Self Esteem  $F=.899$ ,  $p=.625$  or Appearance Self Esteem  $F=1.060$ ,  $p=.47$  (see Figure 2.6). Furthermore, no interaction effect of Narcissism and General Self-Esteem  $F=.933$ ,  $p=.55$ , Social Self Esteem  $F=1.328$ ,  $p=.45$  or Appearance Self Esteem  $F=2.202$ ,  $p=.14$  was found. In short, people who tended not to look at the calendar did so because they were more narcissistic and preoccupied with looking at themselves in the mirror.



**Figure 2.4 Percentage of participants that looked toward the stimulus calendar, in either the provocative or neutral stimulus during a one-minute interval. A mirror was present in the provocative and neutral conditions. No mirror was present in the control condition.**



**Figure 2.5 Measure of Narcissism as a function of participant looking behaviour towards the calendar. Those who rate higher on the narcissism scale are less likely to look at the stimulus calendar**



**Figure 2.6 Self-awareness manipulations have been shown to be mediated by individuals' Self Esteem levels. Here three different types of self-esteem were measured and are depicted**

**as a function of participant's looking behaviour toward the calendar. No relationship between the different measures of self-esteem and looking behavior was found.**

### **2.2.3 Discussion**

The aim of the present study was to investigate if heightened self-awareness alone, without any implication that another person could be monitoring one's behaviour (e.g., via a camera) is sufficient to induce prosocial looking knowledge. If self-awareness alone is enough to induce prosocial looking behaviour, it was expected the mirror being present would reduce looks to the sexy calendar more than to the neutral calendar, replicating Risko and Kingstone (2011).

The findings of the present study failed to support this idea. I found that placing a mirror in the room with a sexy calendar did not selectively reduce the looks participants made to the sexually provocative calendar. Looks to the sexually provocative calendar were as likely as to the neutral calendar, conflicting with Risko and Kingstone (2011) finding that a camera especially impacted looking behaviour to the sexy calendar. There was in fact no significant difference in looks to the calendars with or without a mirror. What a mirror did do, consistent with it increasing self-awareness, is result in people who tend towards narcissism being more inclined to look at themselves in the mirror.

These data converge with the core idea that in the paradigm used by Risko and Kingstone (2011), and in Study 1, it is an *implied* social presence of *another* person that is driving the effect, rather than increased attention to one's own self in isolation. In other words, increasing one's attention to one's own behaviour *alone* does not seem to be sufficient to produce a change in looking behaviour. What seems to be important is the knowledge or the implication that one's behaviour will be observed by another person. The studies in the next chapter pursue what factors

might be mediating real and implied social presence effects.

### **2.3 General Discussion**

The first goal for this chapter was to explore how social presence may affect looking behaviour over time, that is, whether the effect is transient or sustained in a paradigm based on Risko and Kingstone (2011). This would begin to shed light on the underlying mechanism of the social presence effect. Study 1 established that there is an effect of time on social presence, with social presence disappearing over time. That social presence is transient is of interest as it suggests that monitoring one's own behaviour may be a cognitive demanding activity that passes over time. This possibility is addressed explicitly in Chapter 4.

The second aim was to explore if the implied presence of an "other" (e.g., being recorded by a camera that might be observed by another person) is critical to the prosocial behaviour observed in Study 1 and Risko and Kingstone (2011), or if simply being more "self-aware" is sufficient (e.g., looking at one's own self in the mirror). Study 2 indicated that without the implied presence of another -- that is, increasing self-awareness without introducing the implied presence of another person -- is not sufficient for the emergence of a social presence effect. In other words, it appears that presence of another, implied vis-à-vis an eye tracker, is a necessary condition. Solely increasing self-awareness is not sufficient.

Building on these findings -- that the paradigm I am using taps into a transient (Study 1) social presence effect (i.e., it is not solely a self-awareness effect; Study 2) -- the next chapter examines two key questions. How does implied social presence compare to real social presence? And can a social presence effect be isolated to eye movements alone?

### **Chapter 3**

Although Risko and Kingstone (2011) find that implied presence, mediated by an eye tracker, leads to people displaying more socially appropriate looking behavior, their research paradigm measures eye *and* head orienting, rather than eye gaze specifically, and their paradigm is only able to acquire a single, rather rudimentary measure -- does a person turn their head to enable their eyes to look at the calendar: yes or no? These are important limitations for both theoretically and methodological reasons. Theoretically, it has recently been demonstrated by Solman, Foulsham, and Kingstone (2017) that the eye and head are complementary orienting systems, each governed by a different aim in information acquisition. For instance, head movements are often directed into new visual environments, and these new visual environments are then, subsequently (i.e., post-head movement) explored by the eyes. As the Risko and Kingstone (2011) paradigm required a 90 degree head turn in order to fixate a calendar, it is not clear whether, when the eye tracker operates as an implied social presence, it dissuades a head movement and/or an eye movement toward the provocative calendar. The work in the present chapter addresses this limitation by examining whether an eye tracker can operate as an implied social presence in a manner that affects eye movements alone.

Methodologically, the Risko and Kingstone (2011) paradigm only measures a single solitary head turn and look, and therefore it cannot, for instance, acquire repeated measures over the course of tens or hundreds of trials from the same participant. As such, the existing paradigm, for example, cannot hope to acquire more nuanced measurements of implied social presence on visual attention, including, but not limited to, the effect of implied presence on first fixation, scanning patterns, and the way looking behaviour may change over the course of time. (Note, that in the previous chapter I was able to find that the implied social presence effect can dissipate over a 10 minute period, but when in the 10 minute period the effect begins to wane is unknown, as is the question of whether

the change is gradual or sudden.)

The present chapter sets out to address each of these issues. Theoretically, it seeks to understand if an eye tracker can operate as an implied social presence and impact looking behavior -- specifically, eye movements in the absence of any head movements. In addition to the fact that the principles governing head movements seem to be orthogonal to those of eye movements (Solman, Foulsham, & Kingstone, 2017), there is another reason to think that an eye tracker will *not* operate as an implied social presence when eye movements are isolated and considered alone. One could reasonably argue that looking behavior is unlike any other kind of behavior demonstrated to be influenced by social presence (e.g., helping), in that looking behavior is less dependent on explicit or overt control. Our eyes, at least subjectively, seem to be where they need to be as we go about our interactions with the world. Indeed, researchers have demonstrated that individuals can be unaware that their eyes have moved (Belopolsky, Kramer, & Theeuwes, 2008), and even when individuals are aware of the explicit need to look in a particular direction under certain circumstances, it can be difficult to do so (Munoz & Everling, 2004; Theeuwes, Kramer, Hahn, & Irwin, 1998). Against this background, it is unclear whether we should, or should not, expect that looking behavior will be influenced by a social presence.

Furthermore, in this chapter I begin to examine how the effect of a real person and an implied person (via the eye tracker) compare. As was laid out in Chapter 1, little is known about how implied social presence effects compare to real social presence effects (e.g., are they equivalent or not). Methodologically, then the aim is to develop a research paradigm that enables one to obtain clear, concise, measurements of implied social presence on eye movements (if such an effect exists) in order to enable this comparison. Study 3 represents an initial attempt to create such a paradigm. Study 4 is a refinement of this approach.

### **3.1 Study 3: The effect of real and implied social presence on eye movements alone**

The logic of the present study was built on that of Risko and Kingstone (2011). First, there were stimuli that were sexually provocative in nature (i.e., runway models with minimal clothing), and looking behaviour to them was compared to eye movements to more neutral stimuli. Second, participants need to be aware, or unaware, of the fact that their eye movements are being tracked, in order to compare the possible effect of an implied social presence on looking behaviour. Thus, when participants knew that their eyes were being tracked, the condition for the effect of an implied social presence from the eye tracker was created; and when participants did not know their eye movements were being tracked, there was no opportunity for the eye tracker to operate as an implied social presence.

Unlike Risko and Kingstone (2011), the present series of experiments also included a real social presence condition, in order to assess, and directly compare, implied social presence with real social presence. The prediction is that if eye movements can be sensitive to social presence, then in the real social presence condition, participants will change their natural looking behaviour (i.e., the way that they would look at the images when they are alone) in a manner that presents themselves in a positive light according to the existing social norms. To put it bluntly, participants will seek to minimize committing their eyes to the breasts and genitalia of the runway models, especially when they are sexually provocative (i.e., they are close to naked).

To the extent that an eye tracker can operate as an implied social presence and affect eye movement behaviour, then when participants are aware that their eye movements are being monitored by an eye tracker, the way that they look at the images -- especially those that are

sexually provocative -- will be consistent with those in the real social presence condition. Whether the real and implied social presence conditions are the same, both quantitatively and qualitatively, is of course a fundamental and outstanding question.

In sum, if eye movements -- without any changes in head movements -- are sensitive to the effects of social presence, it is expected that the influence of social presence will be evident in the looking behavior of individuals, with them favoring attention allocation to more socially appropriate content. Whether this effect extends to both real and implied, and how the two types of social presence compare, is unknown.

### **3.1.1 Methods**

*Participants.* A total of 68 participants took part in the study (26 males and 42 females), with an age range of 18 - 36. Participants volunteered for the study and were awarded \$5 payment or course credit. Participants provided consent, and although deception was necessary for the study, they were debriefed and the true purpose of the study was explained when they completed the experiment. Participants had the option to withdraw their eye data if they chose to do so after being debriefed.

*Materials.* Eye movements were measured using the SensoMotoric Instruments RED desktop eye tracking system with a sampling rate of 120 Hz, a tracking range of 40 cm x 20 cm at 70 cm distance from the integrated 22 inch monitor, accuracy of 0.4° and spatial resolution of 0.03°. Stimuli were presented at a resolution of 1680x1050 pixels. Stimuli were chosen from advertisements that depicted neutral models (fully clothed) or provocative in nature (models were minimally clothed). Given that the images were of actors and models in advertisements, images were assumed to be considered attractive to participants. 10 stimuli of each neutral and provocative in nature (20 total) were presented in a randomized order and shown for 10 seconds per trial while

participants viewed these images. Fixations, length of fixations and areas fixated to by participants were recorded.

*Procedure.* Upon arrival in the lab and after giving consent to the study, participants were told that they would be viewing some photographs used in advertisements. Participants were randomly assigned to one of 3 different conditions: implied presence condition (where the source of social presence was the act of being eye tracked), a control condition (no source of social presence, and hence unaware of being eye tracked and also alone in the room) and a real social presence condition (where participant eye movements were watched by an experimenter and although they were eye tracked as well, they were not aware of the eye tracking during the experiment). I employed deception to ensure that participants remained unaware of the true purpose of the study and the eye tracking portion was left out for participants in the *control* and *real presence* groups, as they were to remain unaware of eye tracking.

**Figure 3.1 Has been removed due to copyright restrictions. The material depicted here was that of stimuli seen by participants, with the provocative advert being that of minimally clothed models, whereas a neutral stimulus was that of models fully clothed.**

Once seated, participants in the condition where eye tracking was done without their awareness (control & real presence groups), participants were asked to view ishihara color squares to complete a color blind test. This was done in order to calibrate their looking behavior for the SMI eye tracker without their knowledge. Participants in these conditions were instructed to follow with their eyes a colored circle that moved amongst 9 different locations on the screen and

to note if the colour of the circle changed. Participants that were aware of the eye tracking portion of the experiment (the implied presence group) were walked through a regular calibration.

Once the calibration was completed, participants were asked to view the images on their own while the experimenter waited outside the room and down the hall, with no further instruction given. The one exception concerned those in the real presence condition, where an experimenter monitored participants' eye movements, by way of sitting 2 ft behind and slightly to the left of the participant at the desktop computer. (Note the 2 ft distance was selected as this was found to influence purchaser decisions in a real social presence experiment in Argo, Dahl, & Manchanda, 2005). In this condition, above the computer screen there was a small mirror (4x8 inches) in order for the experimenter to be able to 'watch' the eye movements of the participant while they viewed the images in the reflection of this mirror. This was to simulate the participants looking behavior being 'tracked' by a real person as much as possible. Note that unbeknownst to the participants in this condition, their eye movements were also monitored by the eye tracker.

When participants had completed the viewing portion, the experimenter provided the following questionnaires: the Big Five Inventory (BFI), a Curiosity Inventory Scale, Cultural demographics, Self-awareness inventory, Impression Management Scale, and a manipulation check to confirm a lack of awareness of the eye tracker. Upon completion of the questionnaires, the experimenter debriefed the participants and explained the true purpose of the study, and participants were given the time to ask and the opportunity to have their data discarded. No participant in this study, or any of the subsequent studies asked for their data to be excluded.

### **3.1.2 Results**

*Data Handling.* Areas of Interest were created around the images using SMI's "begaze" analysis software for 3 body areas: face, chest, pelvis and legs. Fixations were extracted and then normalized by calculating the proportion of fixations made to an item based on the total fixations made to the image viewed per trial. A total of 6 participants had to be dropped from the analysis because of loss of eye data due to the free viewing nature of the SMI setup, or from faulty eye tracking/technical errors.<sup>1</sup>

*Analysis.* The looking behaviour in terms of proportion of fixations to the paired images was examined, over each second of the viewing time (10 seconds), with factors of interest being that of condition of social presence, provocativeness of the images, area of interest (AOI), and the 10 second time course.<sup>2</sup> The data were assessed by way of a mixed ANOVA. No main effects are revealed for time<sup>3</sup>, condition of presence or AOI.

There was a significant two-way interaction between AOI and condition of presence  $F(2,62)=3.436, p<.05$ . Post hoc comparisons indicate that participants in the no social presence condition ( $M=33\%$   $SD=5\%$ ) looked less at the face of the models than those in the real social presence condition ( $M=54\%$   $SD=6\%$ ) and those in the implied presence condition ( $M=44\%$   $SD=5\%$ ) (see Figure 3.2). All post hoc multiple comparisons are derived from Bonferroni post hoc tests, with significant comparisons taken at  $p < .05$ , with this approach applying to all the

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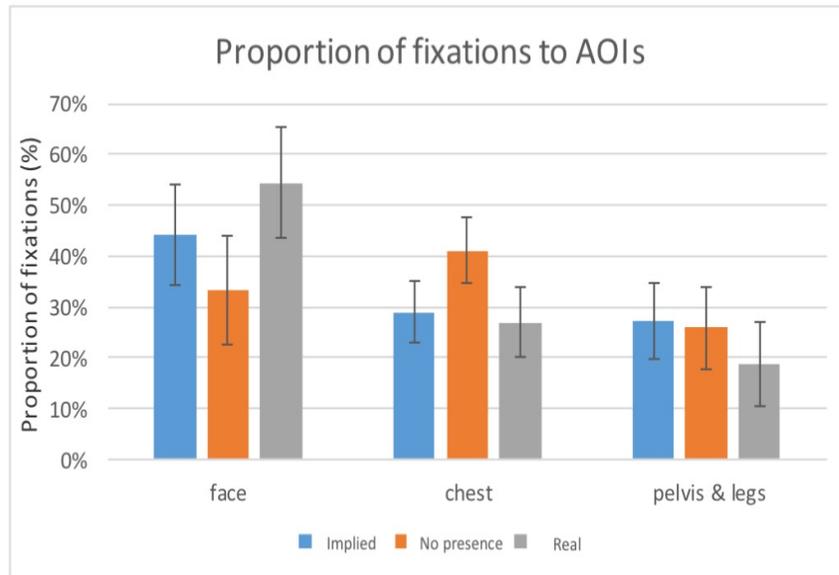
<sup>1</sup> Another comparable way to analyse the data is to measure fixation dwell time, that is, the amount of time spent looking at stimuli. Because the number of looks, and the total time looking, are highly related, I only report proportion of fixations. Moreover, when dwell time is analysed, those data converge with and do not contradict the analyses reported here.

<sup>2</sup> Participant gender was not included in the analysis here due to disproportionately large number of female participants. In the general discussion there is a meta analysis included where gender is analysed across all common studies from pooled data.

<sup>3</sup> Time is never found to be a factor in these analyses, hence for this study and comparable ones in the thesis, it will not be mentioned further. Similarly, when looking at a subset of the fixations (e.g., the first 15 fixations) for studies 3,4,5 and 6, no effect is found, therefore this analysis was left out of the document.

studies reported in the thesis. Fixations towards the chest were also significantly higher for the no presence condition (M=41% SD=3%) compared to both the real presence (M=27% SD=3%) and the implied conditions (M=29% SD=3%). There was no significant three-way interaction between provocativeness of image, condition of presence and AOI  $F(4,124) = .890, p = .473$ .

For the analysis of the questionnaire data, fixations to the neutral images were negatively correlated with the BFI score for neuroticism  $r = -.680, p = .002$  in the implied presence condition. This would suggest that participants in the implied presence condition rating lower for neuroticism were more likely to make more fixations during the neutral images. In the no social presence condition, fixations to neutral images are negatively correlated with the measure of agreeableness  $r = -.445, p = .038$ , indicating participants in a condition of no social presence that rate lower on agreeableness were more likely to make more fixations during the neutral images. No other questionnaire variables correlated with fixations to either type of image for the real presence condition.



**Figure 3.2** The proportion of fixations to AOIs of the face, chest and pelvis and legs as a function of social presence.

### 3.1.3 Discussion

The focus of this study was to first explore how an eye tracker might impact looking behavior, specifically looking at eye movements in the absence of any head movements. The results indicate that participants in conditions of social presence, both when it is implied presence (awareness of the eye tracker) or a real social presence (a real person monitoring eye movements)

exhibited changes in looking behaviour when compared to a control condition of no social presence. This clearly confirms that there is a social presence effect for eye movements only, independent of a head movement, a novel finding that previously had not been reported.

In this study, I also have the first documented comparison of real and implied social presence for eye movements, with findings indicating that participants in the implied and real social presence conditions look more at the face than other areas, whereas those in the control condition look less at the face and more at the chest area. This comparison indicates that implied and real social presence are comparable in terms of looking behaviour in the present paradigm. I can conclude from these findings that the oculomotor system is susceptible to influences of social presence, with individuals showing a preference for fixating on the more socially acceptable areas of an image - specifically the face - for both real and implied social presence relative to a no social presence control condition.

Interestingly, these findings were not modulated by how provocative the images were. There were several reasons why this might be. The models might be sexually provocative regardless of the level of clothing. Additionally, the advertisements were fairly "noisy" in terms of the content, such as the images contained many items other than models to fixate upon (e.g., logos and labels). In the next study I address these limitations by creating more controlled images.

### **3.2 Study 4: Social presence effects on gaze allocation in a forced choice paradigm**

Perhaps the primary take home from Study 3, apart from real and implied presence seeming to be comparable effects, is that there is evidence suggesting that an eye tracker *can* operate as an implied social presence for eye movements that do not involve a head turn, unlike the study of

Risko and Kingstone (2011) and Study 1 of the present thesis. When participants knew that their eye movements were being monitored by the eye tracker or a real person they made more fixations to the faces of the models; but when they thought their eyes were not being monitored they looked more at the model's chest.

Contrary to my expectation, however, these effects did not interact with how provocative (i.e., little clothing) the models were wearing. I had thought that as the models became less clothed, the effects of social presence would become greater. In addition, while there was a trend toward a difference between real versus implied presence, it failed to reach statistical significance. One possible reason for why these factors failed to have a significant impact on performance may stem from the fact that the images used were poorly matched and controlled (e.g., in terms of other factors that can affect looking performance, such as position of the people within the images, their size, the presence (or lack thereof) of text, and so forth). This may have introduced behavioural 'noise' into the system -- that is, factors that were differentially controlling eye movements across the images - which undermined my ability to extract the impact of a factor such as provocativeness. Nevertheless, on a positive note, if this limitation is a real one, then one can take heart in the fact that social presence effect must be substantial insofar as it can express itself above the other noise.

Another limitation of the previous study is that it compared provocative images between trials. A more sensitive method is to implement, within a trial, a two alternative forced-choice (2AFC) psychophysical method (e.g., Fechner, 1860/1966) that allows one to directly pit one stimulus against another. In such a design, an observer is presented with two alternative options, simultaneously, and selection preference for one versus the other can be compared within the same trial. Study 4 applied this improved research design.

Again in this experiment, as well as in all those that follow, there are three fundamental

conditions: (i). a control condition with no social presence that establishes the baseline performance measure; (ii) a real presence condition that introduces a live physical presence into the test environment; and (iii) an implied social presence manipulation, e.g., an eye tracker that the participant is aware of. The stimuli viewed include images of provocative or neutral content. Images are classified as provocative when there is minimal clothing worn by the models in the images, e.g., undergarments only, versus the fully clothed models in the neutral stimuli (see appendix).

In the present experiment I hypothesize that if people know that their eye movements are being recorded (implied presence condition), or feel like they are being monitored by a person in the room (real presence), they will avoid looking at the provocative images and fixate more on the neutral images (the more socially appropriate item to look at) when given the choice to look at one or the other on the monitor, and/or fixate more on the face than the body. I further expect that this pattern will be stronger (or perhaps even reverse) relative to the baseline, no presence control condition.

### **3.2.1 Method**

*Participants.* A total of 64 participants took part in the study (16 males and 48 females) with an age range of 18 - 32. Participants volunteered for the study and were awarded \$5 payment or course credit. Participants provided consent, and although deception was necessary for the study, they were debriefed and the true purpose of the study was explained when they completed the experiment. Participants had the option to withdraw their eye data if they chose to do so after being debriefed.

*Materials.* Eye movement data was measured using the same SensoMotoric Instruments RED desktop eye tracking system and settings as before. Stimuli were presented at a resolution of

1680x1050 pixels. Visual stimuli were 20 same-sex pairs of 10 male and 10 female with each pair depicting a minimally clothed model vs. one that was fully clothed (see Figure 3.3). Given that the images were runway models, images were assumed to be considered attractive to participants.

Stimuli were presented in a randomized order and shown for 10 seconds while participants viewed the images. Fixations, length of fixations, and areas fixation were made to were recorded. To avoid a central bias the images of models were shown to the left and right of the central area of the screen (left to right separation between images was  $8.4^\circ$ ).

*Procedure.* Once participants were given some initial information (e.g., the anticipated length of the study), and they provided consent, they were told that they would be viewing images on a computer screen. As was done in the previous study, participants were randomly assigned to 3 different conditions: implied presence condition (where the source of social presence was the act of being eye tracked), a control condition (no source of social presence, and hence unaware of being eye tracked and also alone in the room) and a real social presence condition (where participant eye movements were watched by an experimenter). I did employ deception as before to ensure that participants remained unaware of the true purpose of the study and the fact that their eyes were being monitored by an eye tracker was left out for participants in the *control* and *real presence* groups. Here, I also introduced an extra level of deception where participants were told that they would randomly choose a token from a cup with the token denoting what type of images would be presented in the study (e.g., automobiles, landscapes, food, runway models, etc.). In reality, and unbeknownst by the participant, the cup only contained tokens for images of runway models. This deception was done to maintain naiveté as to the true purpose of the study, i.e., not to raise suspicion as to why images of runway models were being presented. Once this procedure

was completed, participants were led to a testing room with a desk, chair and a desktop computer (fitted with the inconspicuous eye tracking system).



**Figure 3.3 A representation of image pairings used, showing a provocative image (minimal clothing) and neutral image (fully clothed) stimulus participants would view during a trial. There were 20 pairs in total, 10 pairings of female models and 10 pairings of male models that were randomly displayed.**

Once seated, participants in the condition where eye tracking was done without their awareness (control & real presence groups), participants were asked to view ishihara color squares as in Study 3. Participants that were aware of the eye tracking portion of the experiment (the implied presence group) were walked through a regular calibration. The final condition was that of the *real presence condition* where the participants remained unaware that there was an eye tracker recording their actual looking behaviour and rather an experimenter monitored their eye movements in person. As was done in Study 3, in the real presence condition the experimenter sat

2 ft behind and slightly to left of the participant at the desktop computer, so that the experimenter could monitor the participant's eyes in the mirror that was mounted about the computer monitor.

Once the viewing portion of the study was complete, the experimenter provided the following questionnaires: the Big Five Inventory (BFI), a Curiosity Inventory Scale, Cultural demographics, Self-awareness inventory, Impression Management Scale and a manipulation check for eye tracker awareness. Upon completion of the questionnaires, participants were debriefed and provided the opportunity to ask questions and to have their data discarded.

### **3.2.2 Results**

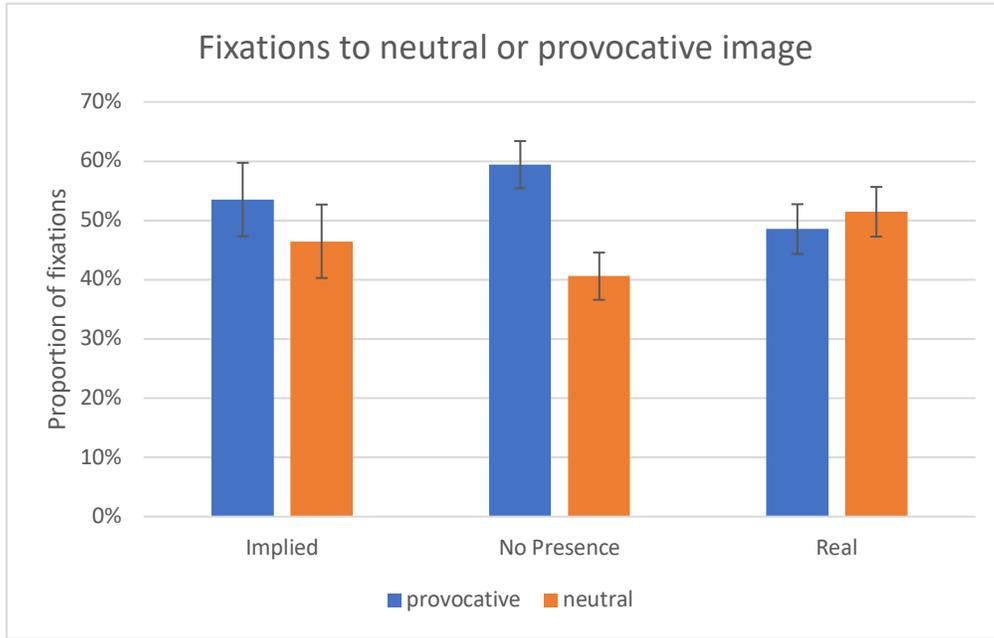
*Data Handling.* Areas of Interest were created and fixations were extracted and normalized as before in Study 3. A total of 7 participants had to be dropped from the analysis due to loss of eye data due to the free viewing nature of the SMI setup, or from faulty eye tracking/technical errors.

*Analysis.* The looking behaviour in terms of proportion of fixations to the paired images was examined, over each second of the viewing time (10 seconds), with factors of interest being that of condition of social presence, provocativeness of the images, area of interest (AOI), and the 10 second time course. The data were assessed by way of a mixed ANOVA and are displayed in Figures 3.4. No main effects were revealed for condition of presence or AOI. There was a marginal main effect of provocativeness of image  $F(1,51) = 3.627, p = .06$ , with more fixations made overall to the provocative image ( $M=52\%$ ,  $SD = 1\%$ ) compared to the neutral image ( $M = 48\%$ ,  $SD = 1\%$ ).

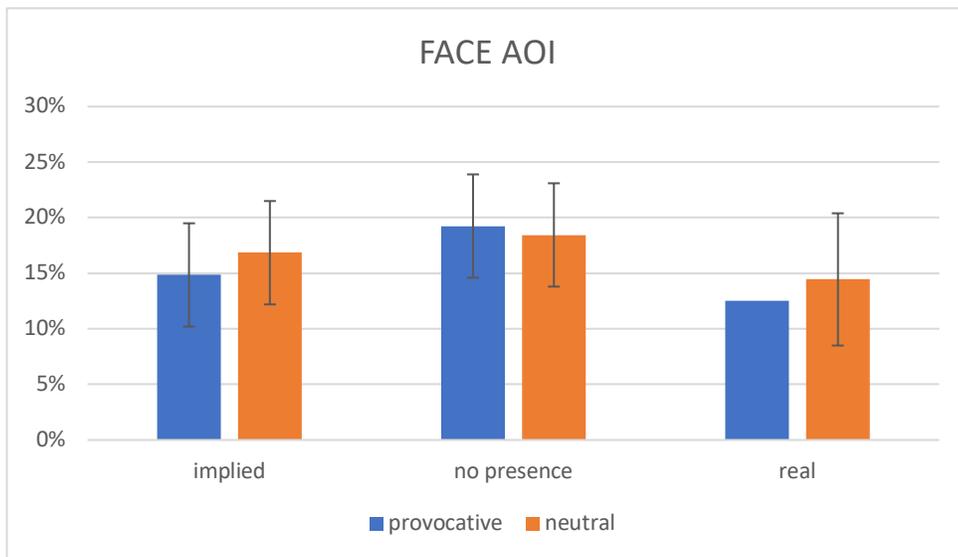
The main effect of provocativeness was qualified by a two-way interaction between provocativeness and social presence  $F(2,51) = 6.507, p=.003$ . Post hoc tests indicated that

participants in the real presence condition (M=55% SD=3%) and the aware condition (M=48%, SD = 2%) looked significantly more at the neutral images ( $p < .05$ ) than those in the unaware condition (M=40%, SD=2%) (see Figure 3.5). There was also a significant interaction of presence and AOI  $F(4,102) = 3.479, p = .01$ . Post hoc comparisons indicated that participants in the no social presence condition (M = 19%, SD = 3%) looked more at the face of the provocative model than those in the real social presence condition (M = 14%, SD = 3%) (see Figure 3.5). They also made more fixations to the chest of the provocative models (M = 19%, SD = 2%) than those in the real social presence condition (M = 14%, SD = 2%) (see Figure 3.6). The no social presence condition also made significantly less fixations to the pelvis and legs of the neutral images (M=11%, SD = 3%) than the implied social presence condition (M = 17%, SD = 2%) and the real social presence condition (M = 24%, SD = 2%) (see Figure 3.7). There was no significant three-way interaction between time, type of image and social presence condition  $F(18, 88) = .712, p = .79$ .

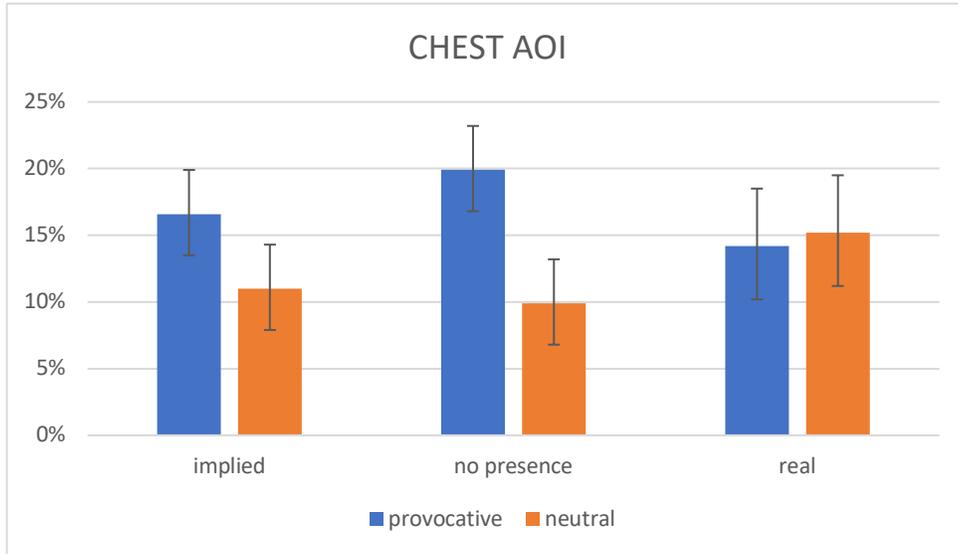
For the analysis of the questionnaire data, fixations to the neutral images were negatively correlated with the BFI score for neuroticism  $r = -.680, p = .002$  in the implied presence condition. This indicates that participants in the implied presence condition that rate low for neuroticism are more likely to look at the neutral items. In the no social presence condition, fixations to neutral images are negatively correlated with the measure of agreeableness  $r = -.445, p = .038$ , indicating participants rating low on agreeableness measures are more like to fixate on the neutral images when there is no social presence. No other questionnaire variables correlated with fixations to either type of image for the real presence condition.



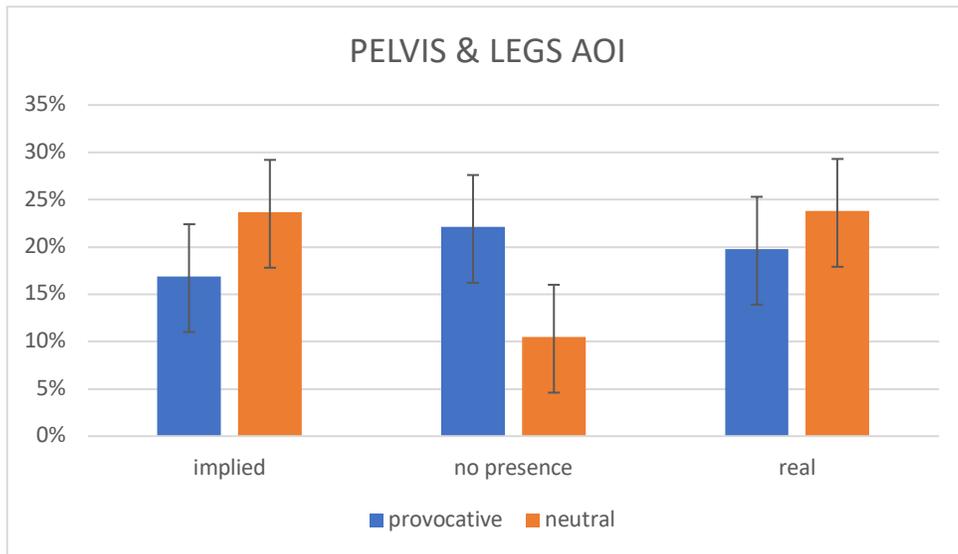
**Figure 3.4** The proportion of fixations made to provocative vs. neutral stimuli by function of social presence.



**Figure 3.5** The proportion of fixations made to the Face AOI for provocative vs. neutral stimuli as a function of social presence.



**Figure 3.6** The proportion of fixations made to the Chest AOI for provocative vs. neutral stimuli as a function of social presence.



**Figure 3.7** The proportion of fixations made to the Pelvis and Legs AOI for provocative vs. neutral stimuli as a function of social presence.

### 3.2.3 Discussion

In the present experiment, the aim was to systematically capture how eye movements are influenced by social presence, when individuals are being recorded (implied presence condition), or feel like they are being monitored by a person in the room (real presence) when looking at images with provocative and neutral content. The expectation is that the more socially appropriate item to look at will be fixated upon more when participants are given the choice to look at provocative or neutral images in situations of social presence (for both real and implied presence) relative to the no presence control condition.

Here I find evidence of differences between real and implied social presence on looking behavior. Participants in both presence conditions, whether that of real or implied presence, make more fixations to images that are neutral in nature vs. the image that is provocative. Those in the unaware condition, where there is no social presence, fixate more on the provocative image and also spend more time looking at the provocative image.

The questionnaire data showed some significant correlations with personality measures, with indications that neuroticism and agreeableness having some impact in fixation allocation to the type of image (neutral or provocative), suggesting that participants in the implied presence condition that rate low for neuroticism are more likely to look at the neutral items whereas participants rating low on agreeableness measures are more like to fixate on the neutral images when there is no social presence. No other clear indication of individual differences driving eye movements stands out from the other 5 measures taken.

In sum, the findings from this study show clear differences between the social presence groups (both real and implied) when compared to the no social presence group. This confirms that

in situations of real and implied presence, individuals allocate their eye movements in a more socially appropriate manner. Furthermore, implied and real presence are comparable in terms of the effect, with both groups indicating a preference for fixating neutral items.

### **3.3 General Discussion**

The aim of these studies was to establish how eye movements, in isolation, are influenced by social presence and how implied and real presence compare and if their influence is comparable. With these studies, I established a methodologically sound paradigm (the 'Model' Paradigm) to make this comparison, and investigate eye movement allocation in both conditions of real and implied social presence. This is the first time, to my knowledge, that both a real physical presence and an implied presence have been compared across a common metric of eye movements. These findings indicate that implied presence and real physical presence show similar influences on eye gaze, with individuals in both conditions of social presence preferring to allocate their eye movements to images that were neutral in nature, vs. the provocative content. That is, people exert prosocial looking behaviour when they believe that their eyes are being watched by a camera or a person.

There are a variety of key implications given these findings. Methodologically, we demonstrate an important influence on behavior relevant to attention researchers who are interested in using social stimuli. For example, it is clear that both a physical presence and implied presence nature of eye trackers can alter looking behavior. Theoretically for the social presence literature, work comparing real and implied presence is extremely rare. The present data demonstrate that their effects are comparable.

Now that I have established a paradigm that isolates the oculomotor system without any confounding contributions of head movements, it can be used to compare real and implied

presence across factors suggested to be crucial for real social presence effects (see Chapter 1).

Given the findings from this chapter, real and implied presence appear to be equal. The goal of the next series of experiments is to begin to manipulate the key factors identified in Chapter 1 to assess whether the two types of presence are always comparable.

## Chapter 4

### 4.1 Study 5: The effect of cognitive load on real and implied presence

In Chapter 1, Study 1, I found that the effect of implied social presence disappeared over time, within the span of 10 minutes. I proposed that this transient nature of implied presence suggested that monitoring one's own behaviour may be a cognitive demanding activity. The aim of the present study is to test this possibility, explicitly, by manipulating cognitive load. Moreover, given my initial findings that real and implied social presence conditions are comparable when load is not varied, an outstanding question is whether the effects of real and implied social presence will respond in the same way to changes in cognitive load. By teasing apart any differences that may exist when there is a low cognitive vs high cognitive load on participants in situations of implied, real, and no social presence, I aim to answer both these questions. Hence, a cognitive load manipulation is introduced to the 'Model' paradigm introduced previously in Study 4 of Chapter 3.

The working assumption here is that adjusting one's looking behaviour in response to social presence is a cognitively demanding process. Given that it is demanding for individuals to monitor themselves for what is an appropriate behaviour or not (Ward & Mann, 2000), increasing one's cognitive load should reduce a person's ability to modulate their looking behaviour in response to social presence. If prosocial looking behaviour in both real and implied social presence conditions is a controlled process that draws on cognitive resources, then less prosocial eye movements should be seen when cognitive load is high rather than low. Furthermore, if monitoring one's behaviour in the presence of other makes different demands on cognitive resources depending on whether the 'other' person is real or merely implied, then a difference between real and implied social

presence may emerge as the cognitive load changes. For instance, if the cognitive demand is higher in the presence of a real person, then an increase in cognitive load may result in less prosocial looking behaviour.

#### **4.1.1 Methods**

*Participants.* A total of 87 participants took part in the study, 20 males and 67 females with an age range of 18 - 32. Participants volunteered for the study and were awarded \$5 payment or course credit. Participants provided consent, and although deception was necessary for the study, they were debriefed and the true purpose of the study was explained when they completed the experiment. Participants had the option to withdraw their eye data if they chose to do so after being debriefed.

*Materials.* Materials were identical to Study 4 in Chapter 3.

*Procedure.* Participants completed an experiment identical to Study 4 in Chapter 3 in terms of stimuli employing the 'Model' paradigm (provocative and neutral runway models), procedure (deception and colour blindness test as calibration masking) and viewing set up (off centered stimuli and same eye tracker set up) involved, but with an extra component in the viewing phase of the runway model images which manipulated cognitive load (see *appendix*).

Participants were given basic information about the study and then provided consent. The same protocol was followed where participants were asked to draw a token from a cup in order to maintain naivete of the true purpose of the study. With the same conditions as Study 4, Chapter 3, with an implied presence, no presence and real presence condition, participants in the condition where eye tracking was done without their awareness (control & real presence groups), participants were asked to view ishihara color squares to complete the same color blind test

protocol. Participants that were aware of the eye tracking portion of the experiment (the implied presence group) were walked through a regular calibration. The final condition of *real presence condition* was again with an experimenter in the room sitting behind the participant at the desktop computer at 2 ft behind, slightly to the left with the mirror in the same location above the computer screen to simulate conditions of looking behaviour being monitored.

The cognitive load manipulation was the novel portion to this study, and was implemented as follows: participants were given a string of numbers that were either 2 digits (low cognitive load) or 7 digits (high cognitive load) to remember, and they were asked to report those numbers in order after they finished viewing each image pair. Before each image pair they were given a new string of numbers to memorize during 5 seconds of pre-viewing time, then the model images appeared for 10 seconds. Once the viewing time of the model image was over, a new screen appeared prompting participants to enter the string of numbers they had been asked to retain in memory. Once those digits were entered, the participant hit the return key, which resulted in a bland display of 2 seconds followed by a new set of digits to be remembered and signaling the start of the next trial. The rest of the procedure and the manipulations for the three presence conditions were identical to Study 4.



**Figure 4.1 Example of a high cognitive load trial with representative images, where participants memorized a string of 7 digits as they view the paired images of a model. After viewing the model images, participants had to report the string of numbers. In the low cognitive load condition only 2 digits were presented for retention and recall.**

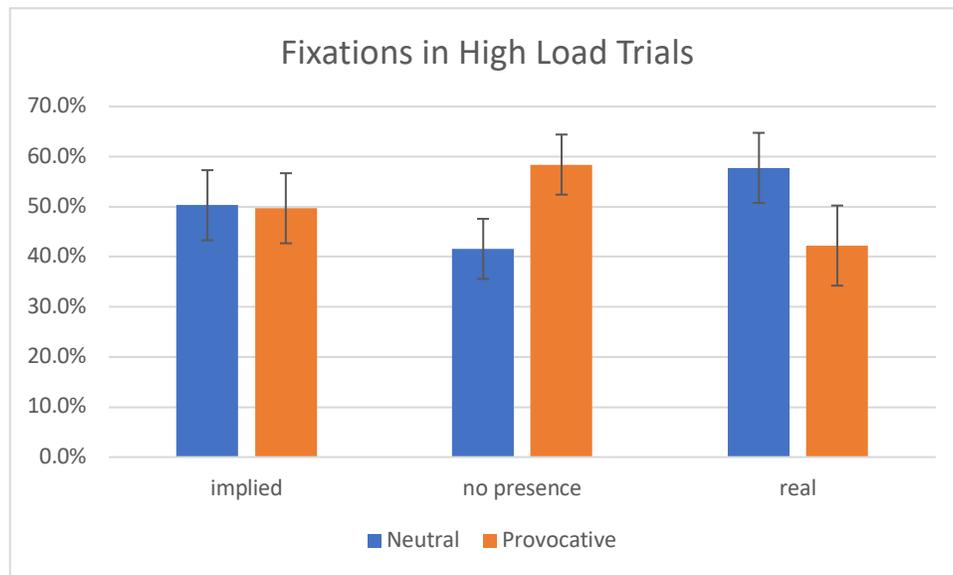
#### **4.1.2 Results**

*Data Handling.* Data Handling was identical to Studies 3 and 4. A total of 8 participants had to be dropped from the analysis due to loss of eye data due to the free viewing nature of the SMI setup, or from faulty eye tracking/technical errors.

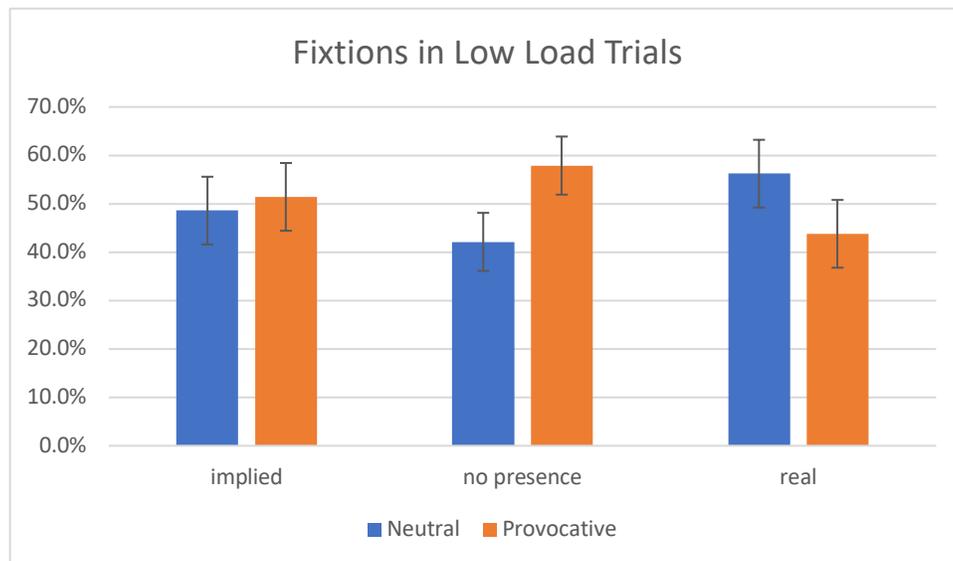
*Analysis.* The ANOVAs were performed as before, with the additional within subject factor of cognitive load (low, high). No main effects were returned for condition of presence or provocativeness. There was, however, a main effect of AOI  $F(2,72) = 4.583, p = .03$ . Post hoc tests indicated more fixations made overall to the pelvis and legs ( $M = 37\%$ ,  $SD = 3\%$ ) compared to the chest ( $M = 28\%$ ,  $SD = 3\%$ ). There was also a main effect of cognitive load  $F(1,73) = 128.065, p < .001$ , with post hoc tests revealing more fixations made by participants in trials where the load

is high (M = 57%, SD = 2%) compared to low (M = 43%, SD = 2%).

The main effect of AOI and cognitive load was qualified by a two-way interaction between AOI and cognitive load  $F(2,146) = 13.91, p < .001$ . Post hoc tests indicate participants look more at the faces of models in the high load trials (M=43%, SD=3%) than in the low load trials (M=35%, SD=3%). There was also a significant two-way interaction between type of image and condition of presence  $F(2,73) = 6.478, p = .005$ . Post hoc tests revealed participants in the no social presence condition looked less at the neutral images (M=42%, SD = 2%) than participants in the implied presence condition (M=49%, SD=3%) and those in the real presence condition looked most at the neutral images, significantly more than either of the other presence conditions (M = 57%, SD = 3%). There were no significant higher level interactions found.



**Figure 4.2** Fixations in the high load trials to neutral and provocative stimuli as a function of social presence.



**Figure 4.3** Fixations in the low load trials to neutral and provocative stimuli as a function of social presence.

I also investigated if there were any differences in the number of items correctly remembered by participants as is customary in cognitive load analysis. A one way ANOVA indicates no significant difference on how many of the strings of numbers were remembered correctly by participants based on condition of presence  $F(2,53) = 2.198, p = .12$

For the analysis of the questionnaire data, no overall correlations were significant. When comparing across conditions of social presence, I found a significant positive correlation for those in the no social presence condition between fixations to the neutral stimuli and BFI score for extraversion  $r = .437, p = .003$ , as well as the agreeableness  $r = .520, p = .02$ . This would indicate that participants in the no social presence condition that rated higher for agreeableness and extraversion were more likely to look at the neutral items. No other questionnaire variables revealed correlations of significance.

### 4.1.3 Discussion

Here I set out to understand how cognitive mechanisms, specifically cognitive load, might modulate real and implied social presence effects. It was predicted that if looking in a prosocial manner for the real and implied social presence conditions is a controlled process that draws on cognitive resources, then less prosocial looking behaviours will be observed for the high cognitive load than the low cognitive load. To the extent that the two processes are qualitatively similar, but quantitatively they draw on cognitive resources differently, one might expect that cognitive load will have an impact on both real and implied social presence, but the amount of that effect will differ between the two types of social presence.

Replicating Studies 3 and 4, the present investigation observed an effect of real and implied social presence on eye movement behaviour, with presence resulting again in prosocial/impression management behaviour, with more looks being made to the neutral images with social presence than with no social presence. In this sense, the effect of real and implied social presence is qualitatively the same. However, for the first time, I also observed a quantitative difference between real and implied presence. Participants in the real presence condition looked more at the neutral images than the implied social presence condition. This suggests that the magnitude of the social presence effect is greater for real presence than implied presence.

Interestingly, and despite the fact that there was a main effect of cognitive load, and an interaction between load and AOI, load did not interact with social presence. This suggests that the effect of social presence is not making a significant draw on cognitive resources. In fact, the interaction between load and AOI is precisely the opposite of what was expected. Specifically, when participants are under high cognitive load, they are more likely to look at faces of the stimuli than when there is a low cognitive load trial. I had predicted the opposite if prosocial looking

behaviour is a cognitive demanding activity. It is possible, however, that because faces can automatically draw attention to themselves (e.g., Henderson, Williams, & Falk, 2005) that when load is increased and looking behaviour is less controlled, faces capture attention. Thus it is possible that this automatic attraction of faces is over-riding any tendency to look less at the neutral images when load is high and there is a real or implied social presence.

#### **4.2 Study 6: The effect of proximity on real and implied presence**

In Study 5, the replication of previous findings indicates continued support for real and implied social presence being qualitatively similar, in that they both induce prosocial looking behaviour. Furthermore, and for the first time, there was an indication that the effect of real social presence might be quantitatively different (i.e., greater) than implied social presence.

The present study continued with this line of investigation of probing for other differences between real and implied social presence, by turning to Latane's Social Impact Theory (1981). Physical proximity is thought to be one of the key ways that real social presence can impact another person's behaviour. And there are data supporting this position, with Argo et al., (2005) conducting a study to examine how social presence might influence purchasing behaviour. The results of that study indicated that participants would purchase the highest quality brand and spend the most money -- consistent with a form of impression management -- when others were present in the aisle. Critically with this effect of social presence was enhanced when the person (the source of real presence) was closer in proximity to the participant.

What is entirely unknown is the effect of proximity from an implied presence perspective. One could argue that unlike a real person, moving a camera (the source of implied presence) closer

to a person does not impose on one's physical space as much as a real person would. Thus the impact of a change in proximity might be much less for implied presence than real presence. On the other hand, the similarities between real and implied presence have been quite striking, and if a camera is operating as a substitute for an actual person, then like real presence, as proximity increases, so might the effect of implied presence. One critical change here is that the source of implied presence is now a camera, allowing the manipulation of distance, whereas in the previous studies it was always the eye tracker as a source of implied presence.

To get at these issues, in the present study a condition of real presence (real person) will be compared to an implied presence (a security camera). The distance between one of these sources of presence and the participants will be manipulated between groups, and will either be 8 ft (far) or 2 ft (near).

#### **4.2.1 Methods**

*Participants.* A total of 47 participants took part in the study, 12 males and 35 females with an age range of 18 - 29. Participants volunteered for the study and were awarded \$5 payment or course credit. Participants provided consent, and although deception was necessary for the study, they were debriefed and the true purpose of the study was explained when they completed the experiment. Participants had the option to withdraw their eye data if they chose to do so after being debriefed.

*Materials.* Presentation materials were identical to those used in Study 4, as I use the same 'Model' Paradigm, with the difference of a handheld recording camera mounted on a tripod as the source of implied presence. The camera was mounted on a tripod behind the participant, and

pointed towards the location of the participant seated at the monitor at a height of 38 inches. Positioned above the monitor was a mirror (used also in the real presence condition), so that if a participant looked in the mirror, they looked directly into the camera.

*Procedure.* Participants completed an experiment identical to Study 4. The only difference in the present study was the manipulation of proximity of the source of social presence which was manipulated between participants. A tripod with a video camera turned on and pointed at the mirror positioned above the monitor. The camera was positioned at a distance of 2 ft or 8ft, slight to the left of the participant, duplicating the two positions adopted by the experimenter in the real presence conditions.

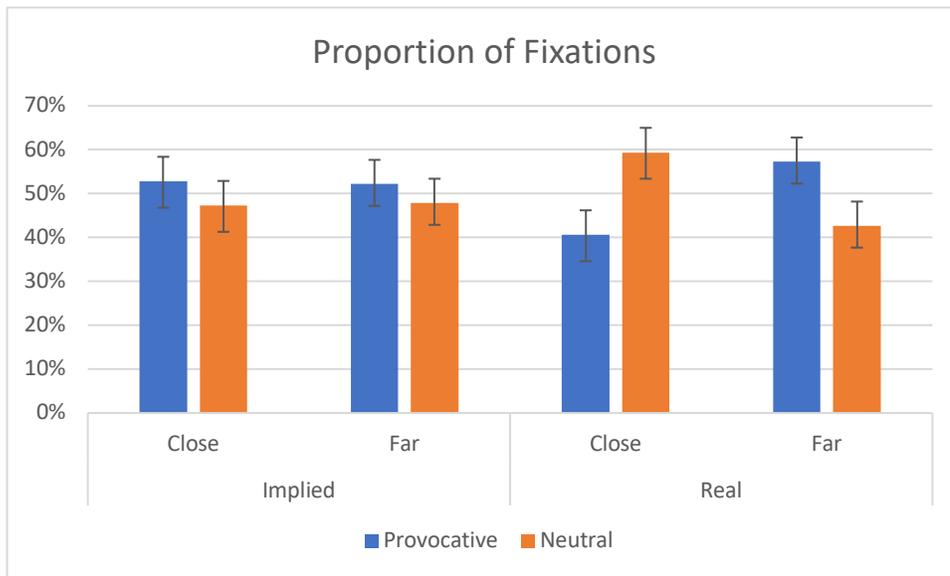
#### **4.2.2 Results**

*Data handling.* Data was handled in the same way as was done in previous studies with this general “Model” paradigm. A total of 4 participants had to be dropped from the analysis due to loss of eye data due to the free viewing nature of the SMI setup, or from faulty eye tracking/technical errors.

*Analysis.* The analysis was conducted identically to the previous study, with the addition of proximity as a factor. There were no main effects for type of image, condition of presence, AOI, or proximity. Furthermore, no two-way interactions were significant. There was, however, a three-way interaction of type of image, condition of presence, and proximity.  $F(1,35) = 7.036, p = .01$ . These data are presented in Figure 4.4.

Post hoc analysis revealed that participants in the real presence close proximity condition made more fixations to the neutral image (M=59%, SD=3%), than the provocative image (M=41%, SD=3%). When this source of presence was far in proximity, participants in the real condition made more fixations to the provocative image (M=57%, SD=4%) than the close proximity condition for

the provocative image (M=41%, SD=3%). This was not found to be the case for the implied presence group, where fixations to the neutral image for the close proximity condition (M=47%, SD=3%) were not significantly different compared to far proximity presence (M=48%, SD=3%), and in both case, fixations rates for neutral and provocative images were statistically equivalent ( $p > .05$ ). No higher order interactions were significant.



**Figure 4.4 Proportion of fixations made to the provocative and neutral stimuli, as a function of real and implied social presence, as well as condition of close and far proximity.**

For the analysis of the questionnaire data, I found no overall correlations of significance. When comparing across conditions of social presence, I found a significant positive correlation for those in the real social presence condition between fixations to the neutral stimuli and BFI score for agreeableness  $r = .683$ ,  $p = .03$ , indicating that participants in the real presence condition that rate higher for agreeableness are more likely to look at the neutral stimuli. No other questionnaire variables revealed correlations of significance.

### **4.2.3 Discussion**

In the present experiment the data aligns with the hypothesis that proximity does have an effect in the context of a real social presence. When participants have a source of presence in close proximity to them compared to further away, they make significantly more fixations to neutral images, which is in line with expectations given previous findings of social presence inducing more socially appropriate looking behaviour. Given that at closer proximity it would be more likely that the participants looking behaviour would be monitored rather than at a further distance where a real presence would have more trouble discerning what participants are attending to.

However, and for the first time, there was no effect of implied social presence on looking behaviour in the present study, regardless of proximity. Clearly, the camera is different from the eye tracker that was used prior to this study. It seems that unlike a real person, the camera needs to be very close to the eye in order to serve as an implied social presence and impact eye movement behaviour. It is also important to note that this is the first time in these investigations that I see a reliable difference between implied and real presence, both quantitatively *and* qualitatively.

### **4.3 General Discussion**

The goal of this chapter was to manipulate the key factors identified in Chapter 1 to assess whether the two types of social presence, real and implied, are always comparable. In the first study, I investigated if looking in a prosocial manner for the real and implied social presence conditions might be a controlled process that draws on cognitive resources. Here the prediction was that less prosocial looking behaviours would be observed when cognitive load was increased. The findings reveal the expected effect of real and implied social presence on eye movement behaviour, with more looks being made to the neutral images with social presence than with no

social presence, reiterating a qualitative similarity of real and implied social presence effects. However, for the first time, I also observed a quantitative difference between real and implied presence. Participants in the real presence condition looked more at the neutral images than the implied social presence condition, suggesting that the magnitude of the social presence effect is greater for real presence than implied presence. The effect of social presence did not interact with cognitive load, however, suggesting that there is no significant draw on cognitive load.

In the second study, I dug deeper to investigate the differences between real and implied social presence, by drawing from Latane's Social Impact Theory (1981). In particular, Latane's consideration of physical proximity, which is thought to be one of the key ways that real social presence can impact another person's behaviour. By manipulating proximity in both conditions of real and implied presence, I found that proximity does have an effect for real social presence. When participants have a source of presence in close proximity to them compared to further away, they make significantly more fixations to neutral images. Interestingly, there was no comparable effect of implied social presence when a camera, rather than a person, is 2 or 8 feet away. When this result is combined with the previous findings in this thesis, it seems that in order for an implied social presence to affect eye movements, the active camera needs to be much closer to the eye than 2 feet, i.e., on the order of just a few centimetres as in the case of an eye tracker.

Having found some notable differences in implied and real social presence in this chapter, I now turn to investigating how the effects might influence more real-world behaviours outside of a forced choice paradigm. In the following chapter, I look towards increasing our understanding of how implied and real social presence might impact decision making and choice behaviour in a consumer choice context, by measuring item/product selection and visual attention across real, implied, and no social presence conditions. In order to do this, I will be returning to the

experimental design of the eye tracker as the implied social presence source, based on the lack of sensitivity with a mounted camera on a tripod in Study 6. The eye tracker as an implied presence source has resulted in consistent behavioural equivalence between real and implied presence and will allow for a more reliable comparison between these types of social presence in a more real-life purchasing decision scenario.

## Chapter 5

### 5.1 Study 7: The effect of presence on attention to products and purchasing behaviour

Understanding how implied and real presences are similar or different from each other is important in more than just the field of cognitive and social psychology, given that social factors play a key role in all aspects of human life, including consumer behaviour (Bearden & Etzel, 1982). The impact of social presence on consumer behavior has been shown to influence consumer emotions and choices during product purchases (Argo et al., 2005; Dahl et al., 2001; Zhou & Soman, 2003). As noted in Chapter 1, Dahl, Manchanda, and Argo, (2001) investigated the effect of real and implied social presence on product purchase that may be embarrassing (the act of buying a condom). Physical social presence was manipulated by use of a trained confederate standing near the condom display. Participants reported significantly less embarrassment in the no presence condition (alone in the aisle) when compared to the presence condition (confederate in the aisle), but embarrassment was felt much more by those who were not familiar with condom purchases. In the implied presence version of the task, participants were sent to a condom vending machine within a restroom of a building where they made the condom purchase and subsequently returned to the experimenters. Results showed that participants who spontaneously imagined the presence of others increased their ratings of embarrassment, and that familiarity actually reduced the likelihood of imagining an audience (implied social presence) but it did not interact with participant's embarrassment as it did in the real presence condition. Converging with my results in the previous chapter, this evidence suggests a difference between real and imagined presence. Indeed, Dahl et al., (2001) discuss that there is the need to explore the differences that are inherently likely in real versus imagined presence, and suggest that research developing an experimental design that use both forms of presence would address why their own findings are not

consistent between their real and imagined presence manipulations.

Here I investigate if, and how, implied and real social presence are different in a consumer choice context, by measuring item/product selection and visual attention across real, implied, and no social presence conditions. I have returned to including a no social presence condition here, as this is a new and unique real-life decision making paradigm that I am employing, and therefore I cannot rely on my previous no presence results to provide a comprehensive baseline against which to compare the implied and real presence conditions. Nevertheless, based on my previous studies, and the extant literature, I expect that the participants in either the real social presence or implied social presence conditions will seek to present themselves in a more positive light by devoting more visual attention to, and subsequently choosing to buy items that are from more expensive brand names compared to less expensive generic version of the same product (i.e., a form of impression management). I also expect participants to avoid attending and choosing products that are potentially more embarrassing in nature (e.g., feminine hygiene products or sexual aids) compared to more neutral items.

In the present study individuals viewed pairs of products on a monitor for 10 seconds before prompted to make a purchase choice by selecting an item from the pairing they viewed. The dependent variables here were visual attention (measured by fixations/looks made to an item recorded by the eye tracker) as well as mouse clicks that were made by participants indicating what item they chose. Product choice and visual attention were measured in order to assess whether participants chose and attended to more brand name and neutral products while avoiding attending to less socially desirable (generic and embarrassing/inappropriate) products. Real and implied social presence was manipulated as in Chapters 3 and 4.

## 5.2 Methods

*Participants.* A total of 91 participants (19 male and 70 female) took part in our study. The sample consisted of undergraduate students from the University of British Columbia who participated for course credit or payment of \$10.

*Materials.* In place of the provocative and neutral models used in Chapters 3 and 4, the present study used provocative and neutral products. There were 80 number of paired items in total. Each stimuli pair was presented at a resolution of 1680x1050 pixels on the computer monitor. The provocative items were images such as condoms, feminine hygiene products, lotion packaging with provocative models, and personal lubricant; the neutral items were Kleenex, laundry soap or packaging for the same items with neutral models. Similarly, the brand items were items such as batteries, socks, and deodorant; the generic items being generic versions of these products. See Figure 5.1 for an example of the items, and the Appendix for a full illustration of the items. Computer speakers were used to generate a tone after the 10 second viewing period had elapsed, which signalled for the participants to then make their produce choice selection. To avoid a central bias the images of models were shown to the left and right of the central area of the screen (left to right separation between images was 8.4°).

*Procedure.* Participants completed an experiment similar to previous studies in Chapters 3 and 4 in terms of the procedure (deception and colour blindness test as calibration masking in the relevant presence conditions) and viewing set up (off centered stimuli and same eye tracker set up) involved as well as conditions of social presence, with the only difference here being the stimuli. Participants were told that they would be seeing supermarket products, and that these were a bank of real supermarket product images that would be randomly paired up on the screen. All participants completed a simple choice task where they viewed pairs of products on a computer

screen, and then they were prompted to make a purchase choice for each trial (Milosavljevic et al. 2010; Pieters et al. 1999). For the images of product pairings, there were 10 unique pairings of provocative versus neutral items, as well as 10 distinct pairings of generic versus brand items (see Figure 5.1 for examples). For each pairing of the target item brand vs. generic brand (or provocative vs. neutral items) there were filler trials with a generic vs. generic (or provocative vs. provocative) and a brand vs. brand (or neutral vs. neutral) pairing (see figure) in order to hide the true purpose of the task. Stimuli were presented in a randomized order and shown for 10 seconds while participants viewed these images, fixations, length of fixations and areas fixation were made by participants made were recorded.

For each trial participants also reported how satisfied they were with their purchase choice. Two products appeared at once on the screen and, following a tone after 10 seconds, were asked to choose between the items as if making a purchase choice. Products were presented in pairings of provocative versus neutral items, 10 of each, as well as 10 distinct pairing of generic versus brand items. For each pairing of the target item brand vs. generic (or provocative vs. neutral) there were filler trials with a generic vs. generic (provocative vs. provocative) and a brand vs. brand (neutral vs. neutral) pairing (see Figure 5.1) in order to hide the true purpose of the task. Pairings were randomly displayed, and target pairing locations were counterbalanced. In order to rule out any central bias of fixations, products appeared on far left and far right of the screen.

**Figure 5.1 Has been removed due to copyright restrictions. The material depicted here was that of stimuli seen by participants with a sample of images from depicting a brand OTC painkiller vs. another brand OTC painkiller (filler trial), generic OTC pain killer vs.**

**another generic OTC painkiller (filler trial) and a generic vs. brand OTC pain killer (target trial).**

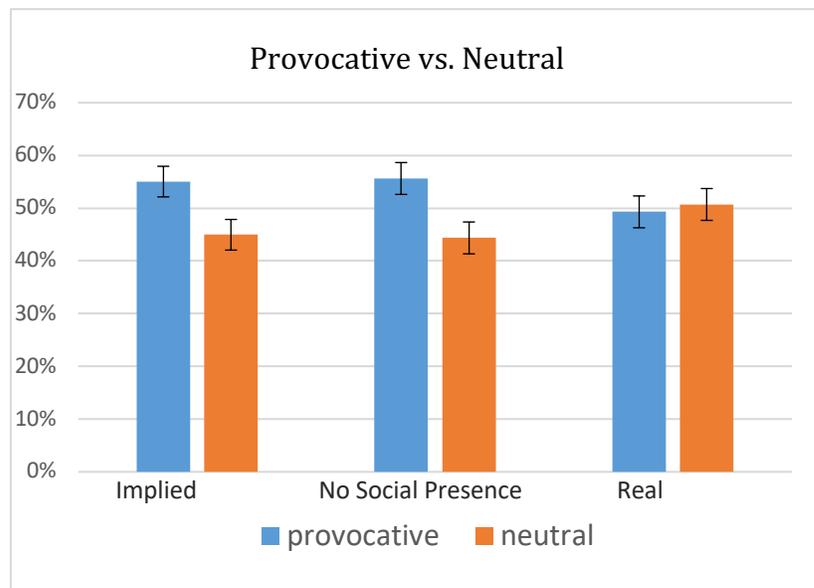
Participants were instructed to make their purchase decision as they normally would and to assume ‘that the products displayed were on their shopping list that day’ (Russo & Leclerc, 1994). They were also told that the pair of items they would view would be randomly generated from a bank of products for each trial; specifically that they were items that would be found in the same aisle at a supermarket. The aisle and product category was visible to them while they were viewing the products, as well as a 'price category' denoted with a \$ symbol above the item (see Figure 5.1 for examples) in order to clearly show which items are more expensive rather than leaving it open to interpretation. This was relevant to the brand/generic item pairings, whereas all of the provocative vs. neutral paired items were equal in price labels. Participants were told that what items they select would remain anonymous, in order to control for any implied social presence influence outside of our manipulation.

When the viewing portion of the study was complete, the participants filled out the same questionnaires as in Studies 3-6.

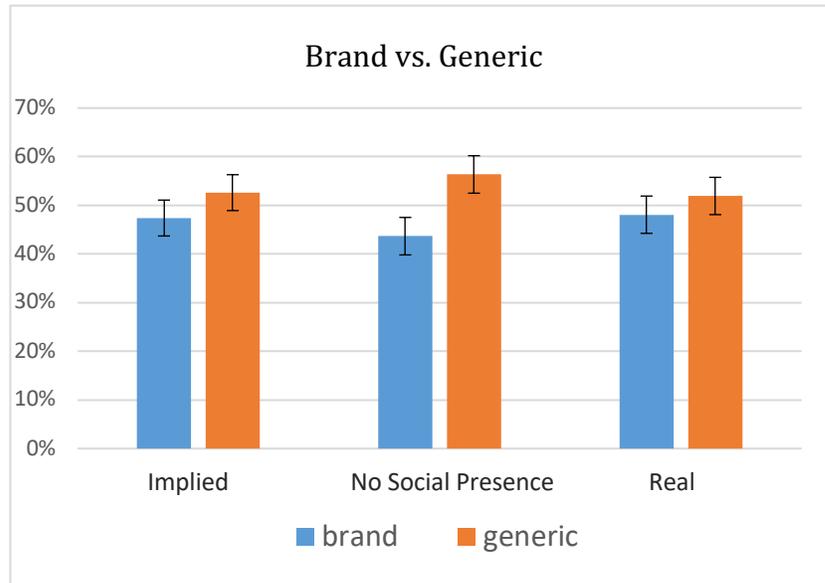
### **5.3 Results**

*Data Handling.* Data handling was conducted identically to previous studies. A total of 14 participants had to be dropped from analysis due to loss of eye data resulting from the free viewing nature of the experiment, or from faulty eye tracking/technical errors. Choice data was obtained via the eye-tracker's SMI's “begaze” analysis software, which was measured as mouse clicks to the item that participants chose to purchase.

*Looking Behaviour.* A Mixed ANOVA of fixations to generic vs. brand product type, provocative vs. neutral product type, and condition of social presence (a between subject factor) was conducted. No main effects were returned. A significant two-way interaction was returned between fixations to provocative vs. neutral pairings and social presence condition  $F(2,74) = 5.39$ ,  $p < .01$ . Post hoc comparisons revealed a preference to attend to the provocative item in the no social presence condition ( $M=55\%$   $SD =6\%$ ) and implied presence condition ( $M=56\%$   $SD =10\%$ ) when compared to the real presence condition ( $M=49\%$   $SD =6\%$ ) (see Figure 5.2). A similar effect was not found for Brand and Generic pairings (see Figure 5.3).



**Figure 5.2 Proportion of fixations made to provocative vs. neutral items in the target trials as a function of social presence.**

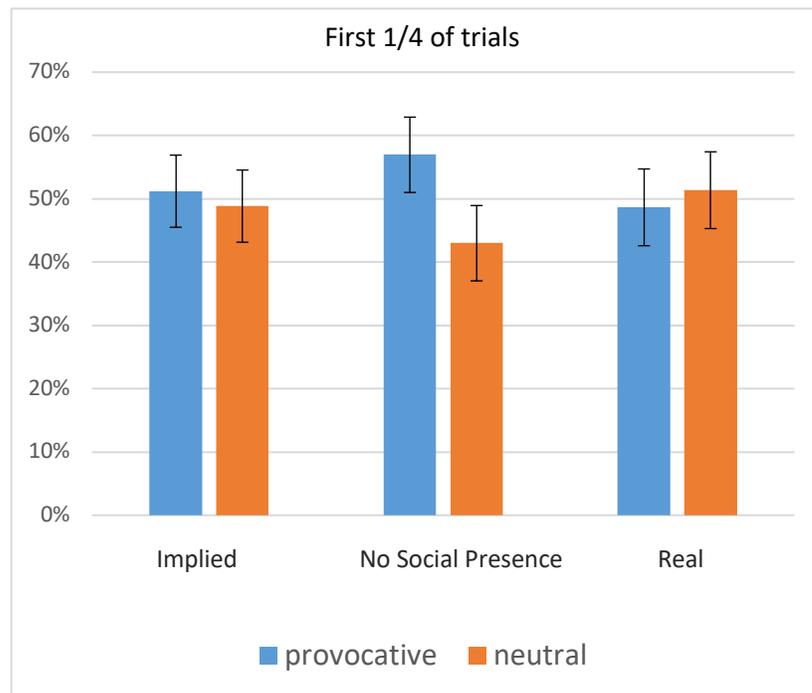


**Figure 5.3 Proportion of fixations made to brand vs. generic items in the target trials as a function of social presence.**

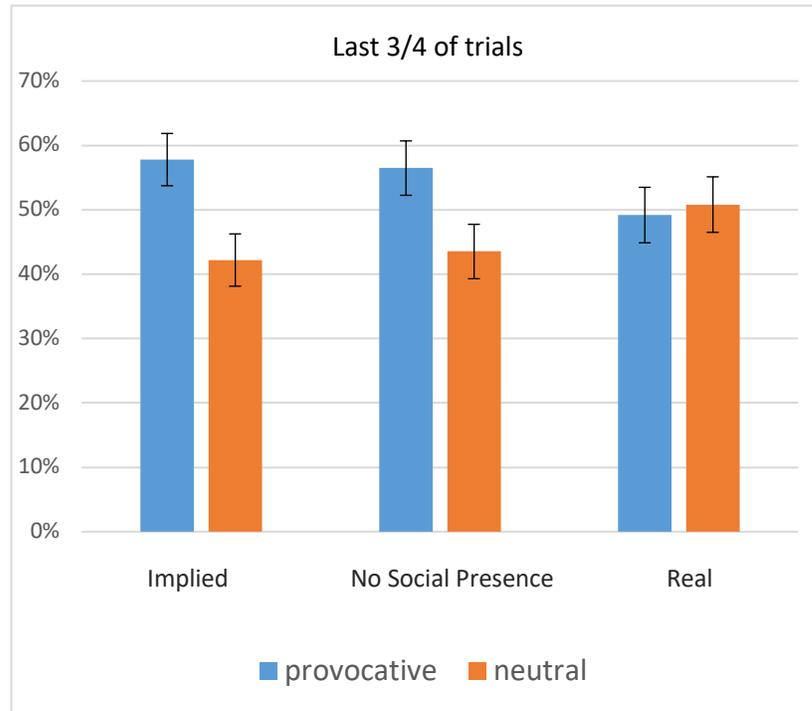
Given that it is known that implied presence diminishes after the first 10 minutes of exposure (Nasiopoulos et al., 2014), and unlike all the previous experiments in this thesis participants spent more than 10 minutes in the viewing task, I broke down the fixation data to compare the first ¼ of trials (roughly the first 10 minutes of the task) against the fixations to the last ¾ of the trials.

For the provocative vs. neutral items, a mixed ANOVA with social presence as a between subject factor and trial portion (first ¼ of trials vs. the last ¾ of the trials) as a within subject factor once again returned a product type by social condition interaction,  $F(2,74) = 5.08, p < .01$ . In addition, a significant three-way interaction of product type, social presence, and trial portion was observed,  $F(2, 74) = 4.75, p < .015$ . Post hoc analysis revealed that there is no change in looking behaviour for real and no social presence conditions across the first 1/4 and last 3/4 trials (see Figures 5.4 and 5.5). Participants in the real presence condition looked at the neutral and

provocative items equally; and in the no presence condition participants looked more at the provocative items. However, in the implied presence condition, for the first ¼ of trials, participants behaved like the real presence condition, fixating no more on the provocative items than the neutral items. But in the last ¾ of trials, participants in the implied presence group behaved like the no presence condition, fixating on the provocative items more (see Figure 5.5).

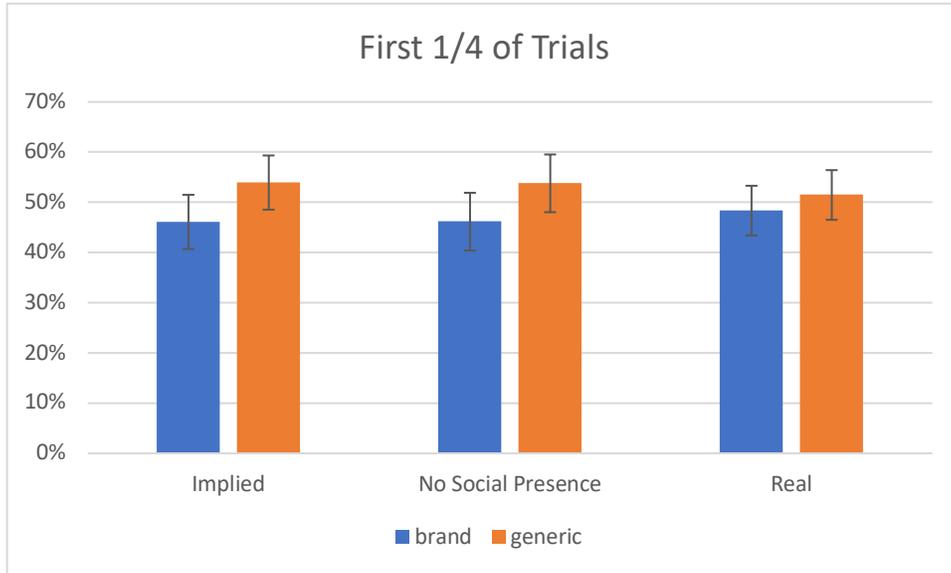


**Figure 5.4 Proportion of fixations made to provocative vs. neutral items in the target trials as a function of social presence, for the ¼ of trials.**

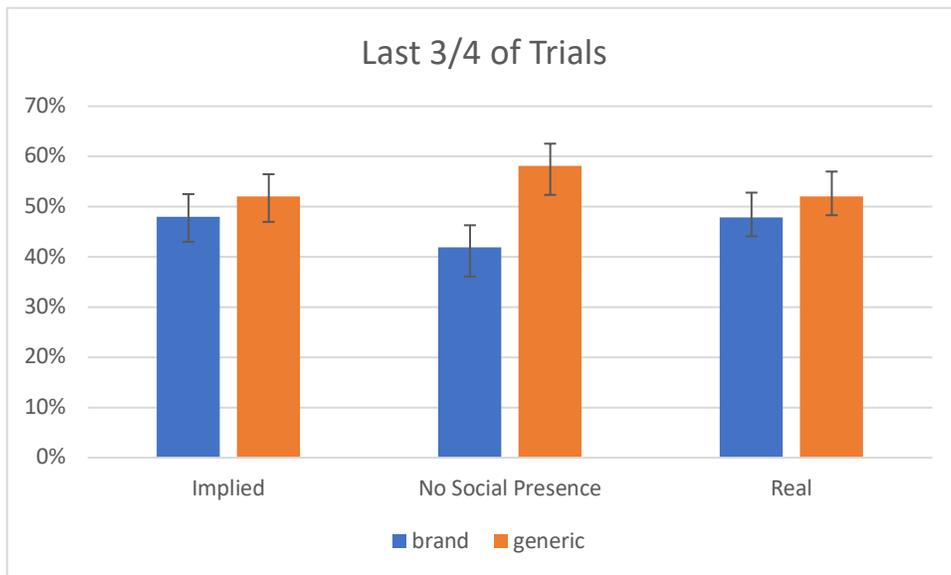


**Figure 5.5 Proportion of fixations made to provocative vs. neutral items in the target trials as a function of social presence, for the  $\frac{3}{4}$  of trials.**

Although there had not been an initial interaction between brand vs. generic items and social presence condition, it remains possible that one would emerge if trial portion were considered. However, a mixed-ANOVA comparable to the one reported above for provocative items revealed no two-way interaction between product type and presence,  $F(2,74) = 1.007$ ,  $p = .371$ , nor a three-way interaction between product type, presence, and trial portion,  $F(2,74) = 1.003$ ,  $p = .372$  with the same brand vs. generic variables as before but this time including portion, first  $\frac{1}{4}$  of trials vs. the last  $\frac{3}{4}$  of the trials (see Figures 5.6 and 5.7).



**Figure 5.6 Proportion of fixations made to brand vs. generic items in the target trials as a function of social presence, for the 1/4 of trials.**

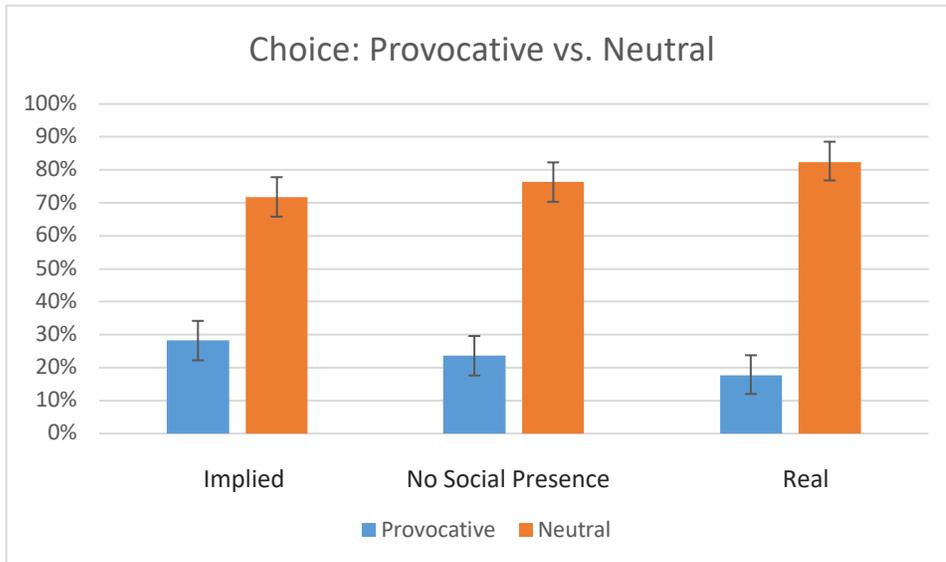


**Figure 5.7 Proportion of fixations made to brand vs. generic items in the target trials as a function of social presence, for the 3/4 of trials.**

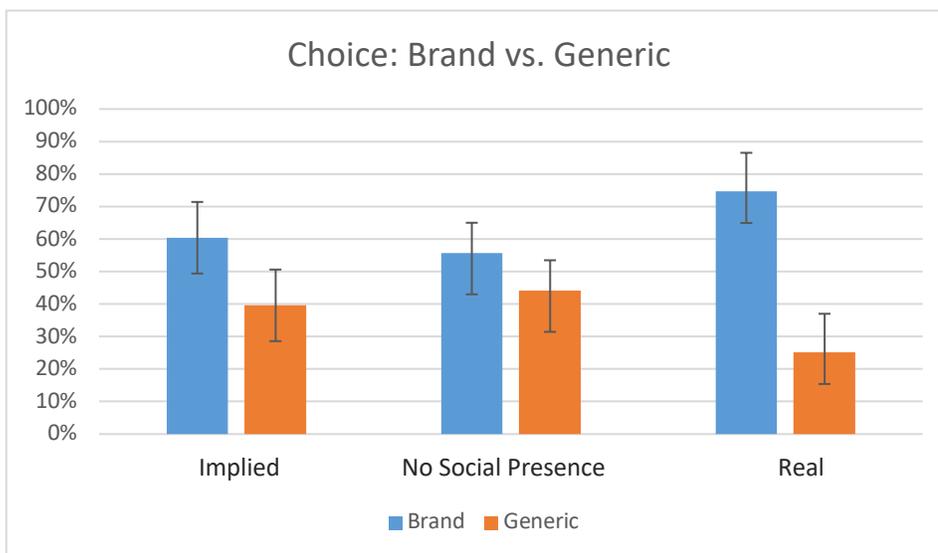
*Choice.* A mixed ANOVA with brand/generic items, provocative/neutral items, and social presence (as a between subject factor) revealed that for choice behaviour there is a significant main effect for provocative/neutral items,  $F(1,74) = 241.25$ ,  $p < .001$ , with post hoc analysis indicating that neutral items ( $M=77\%$ ,  $SD=4\%$ ) were chosen much more than the provocative items ( $M=23\%$ ,  $SD = 4\%$ ). A main effect of brand/generic type  $F(1,74) = 17.82$ ,  $p < .001$ , was also returned, with post hoc analysis indicating brand items were chosen more ( $M=64\%$ ,  $SD =4\%$ ) compared to the generic items ( $M=36\%$ ,  $SD =4\%$ ).

A significant two-way interaction of choice of provocative/neutral items and social presence condition,  $F(2, 74) = 3.40$ ,  $p < .05$ , was also observed. Post hoc comparisons indicate that the two-way interaction was driven by purchasing behaviour in the real presence condition being different from the comparable implied and no presence conditions. Specifically, more neutral items were chosen in the real presence condition ( $M=82\%$   $SD=15\%$ ) than the statistically equivalent implied presence condition ( $M=72\%$   $SD=13\%$ ) and no social presence condition ( $M=76\%$   $SD=17\%$ ).

A significant two-way interaction between choice of brand/generic items and social presence  $F(2,74) = 4.18$ ,  $p < .05$  was also returned. As with the provocative/neutral items, post hoc comparisons revealed that the interaction was driven by the real presence condition, with more brands being selected ( $M=76\%$   $SD=5\%$ ) than the statistically equivalent implied presence ( $M=60\%$   $SD=6\%$ ) and no social presence ( $M=54\%$   $SD=6\%$ ) brand selections.

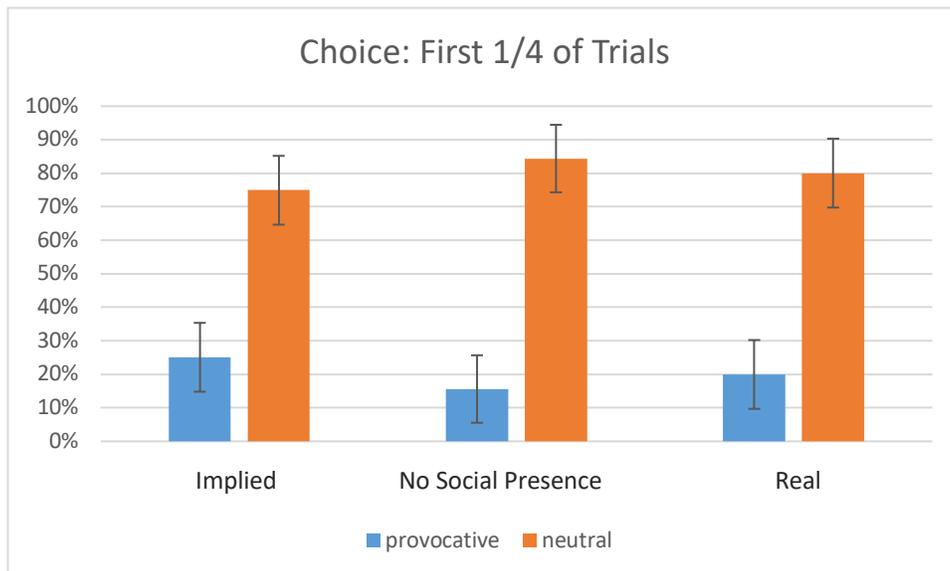


**Figure 5.8 Percentage of choices made of Provocative vs. Neutral items in the target trials as a function of social presence.**

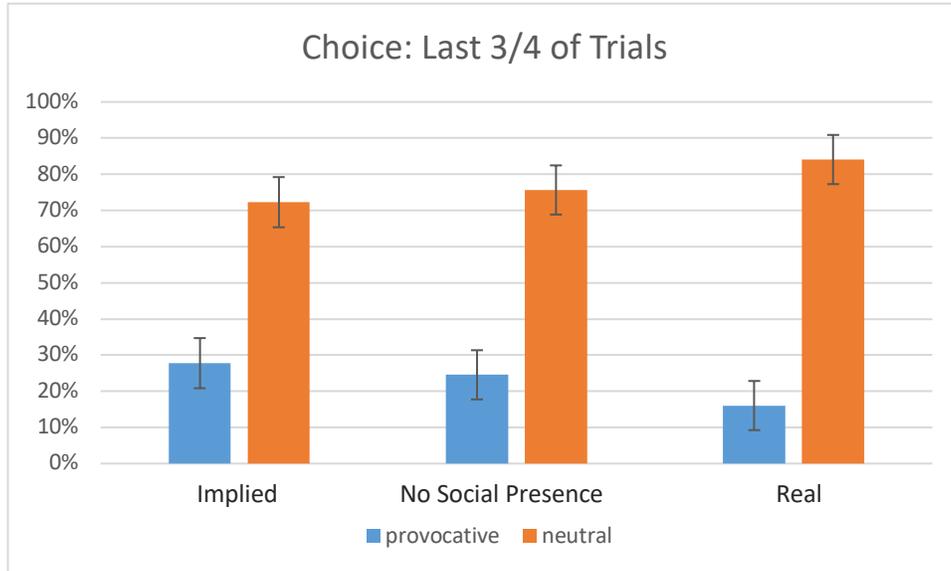


**Figure 5.9 Percentage of choices made of Brand vs. Generic items in the target trials as a function of social presence.**

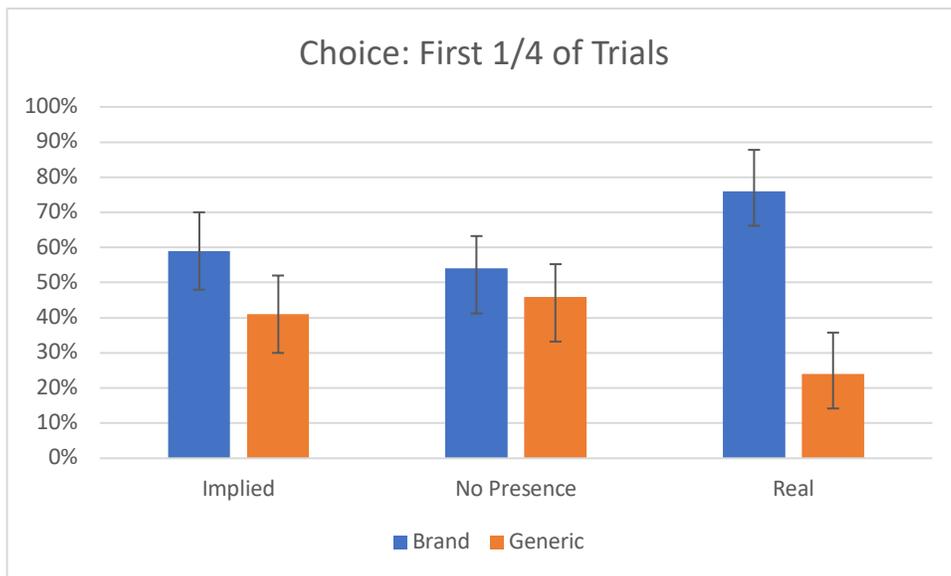
As was done for the looking behaviour analysis, I compared purchases for the first ¼ of trials (roughly first 10 minutes of the task) against the last ¾ of the trials for both provocative/neutral and brand/generic items. A significant three-way interaction of portion, provocative/neutral choice, and social presence  $F(2,74) = 3.103, p = .05$  was returned. As is evident from Figures 5.9 and 5.10, participant always chose the neutral item over the provocative items. However, post hoc analyses revealed that there was no variation in selection patterns between social presence conditions in the first 1/4 of the trials (Figure 5.10); whereas in the final ¾ of the trials more neutral items were chosen in the real presence condition ( $M=84\%$   $SD=15\%$ ) than in the statistically equivalent implied ( $M=72\%$   $SD=18\%$ ) and no presence conditions ( $M=76\%$   $SD=19$ , with more neutral items being selected by the real presence condition (see Figure 5.11). No significant three-way interaction was found for portion, brand/neutral choice and social presence ( $F(2,74) = 1.246, p = .33$  (see Figures 5.12 and 5.13).



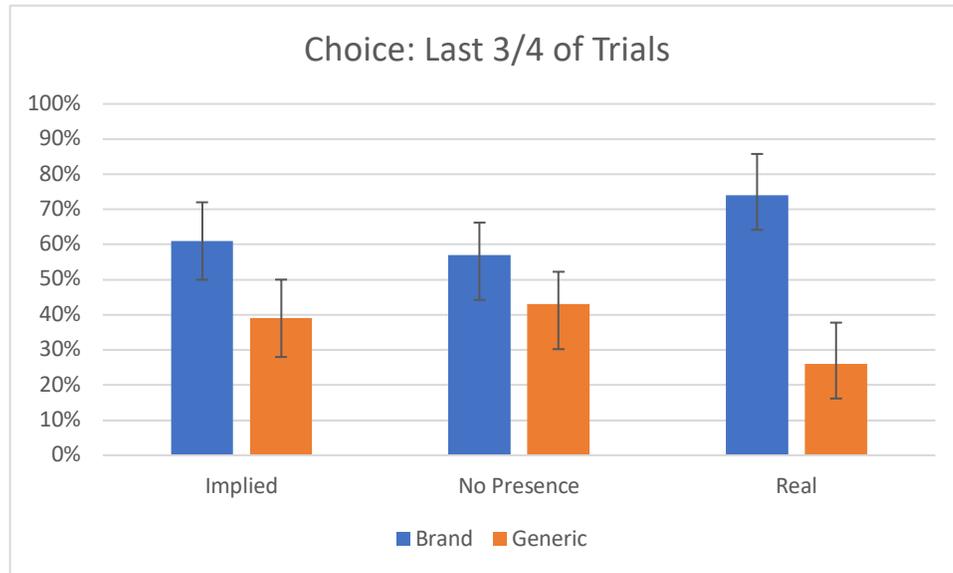
**Figure 5.10 Percentage of choices made of Provocative vs. Neutral items in the first ¼ of target trials as a function of social presence.**



**Figure 5.11 Percentage of choices made of Provocative vs. Neutral items in the last  $\frac{3}{4}$  of target trials as a function of social presence.**



**Figure 5.12 Percentage of choices made of Brand vs. Generic items in the first  $\frac{1}{4}$  of target trials as a function of social presence.**



**Figure 5.13 Percentage of choices made of Brand vs. Generic items in the last  $\frac{3}{4}$  of target trials as a function of social presence.**

For the analysis of the questionnaire data, overall I find that fixations to provocative items are significantly and positively correlated with the curiosity measure  $r=.311$ ,  $p = .007$ , indicating that participants that tend to be more curious, are also likely to look more at the provocative images. When comparing across conditions of social presence, I found a significant positive correlation for those in the no social presence condition between fixations to the provocative products and BFI score for extraversion  $r = .552$ ,  $p = .006$ , as well as the curiosity  $r = .444$ ,  $p = .03$ . This indicates that participants rating higher for extraversion and curiosity are more likely to look at the provocative products when there is no social presence. No other questionnaire variables revealed correlations of significance. These findings may suggest that those who are more curious in nature are more likely to look at the provocative items (although ultimately not more likely to choose them); and when there is no source of social presence this is also the case, although here there is a link to higher levels of extraversion in individuals.

## 5.4 Discussion

The aim of this study was to investigate if implied and real social presence are different in a consumer choice context, by measuring item/product selection and visual attention across real, implied, and no social presence conditions. It was hypothesized that in both the real and implied social presence conditions participants would demonstrate some degree of impression management by allocating more visual attention to, and subsequently choosing to "buy" items that were brand names, compared to their generic counterparts. I also predicted that participants would avoid looking at, and choosing, products that are potentially more embarrassing in nature compared to more neutral items.

The results reveal that attention and choice are influenced by social presence, but in different ways, with the effects varying depending on the type of items participants are viewing. In terms of attention, participants in the real and implied presence conditions attended to items similarly (roughly 50/50) for the initial 10 minutes (first 1/4) of the task while viewing provocative/neutral pairings. However, subsequently, while the influence of real social presence persisted, the influence of implied presence waned. Importantly, this replicates previous findings from Study 2, reiterating the transience of implied social presence. These data also strongly suggest that the implied social presence effect in Study 2 (and Risko & Kingstone, 2011) are not merely limited to head centred looking but generalize to eye movements without head movements. Finally, these data show that real and implied social presence, though quantitatively equivalent in the first 1/4 section of the study are qualitatively different. The effects of implied presence are transient -- disappearing over the last 3/4s of the study; whereas the effects of real presence remain. The result being that in the implied social presence condition participants in the final 3/4 of the study are as likely to look at provocative items as those who believe that they are not being watched at all (no

presence condition). Interestingly, there are no significant interactions of social presence and our visual attention measure for brand/generic pairings, nor is the portion effect of  $\frac{1}{4}$  vs. last  $\frac{3}{4}$  of trials present in these pairings, indicating that the effect of social presence on looking behaviour, insofar as it is related to impression management, varies for the type of item being looked at. Specifically, looking at a sexual item may signal something negative about oneself that looking at a generic item does not. Anecdotally, this dovetails with why 'window shopping' in a store (be it expensive or cheap) is socially acceptable in a way that looking at sexual versus nonsexual items is not.

In terms of actually making a purchasing decision, however, I find that social presence does have an effect on brand/generic selection for the real presence manipulation, with participants choosing the brand item significantly more than the generic version of the product. This finding replicates what was previously shown in the field study by Argo et al. (2005), where participants chose the more expensive brand name product over a generic option when there was a real physical presence. This finding supports the ecological validity of my purchasing paradigm.

It is also worth highlighting the fact that the choice behaviour for generic vs. brand items is not at all predicted by participants' looking behaviour, which is the same case for provocative vs. neutral products. Although there was no indication of preference from looking behaviour to brand or generic items, when participants make a product choice they choose the brand item, especially when social presence is real. For provocative and neutral pairings, participants in general show a bias towards looking at the provocative item (save for real presence), but across all social presence conditions they show an extreme bias towards choosing the neutral item. These results converge with the suggestion above that choice and attention respond to social presence in different ways. For example, looking at items to purchase, and 'actually purchasing an item' are likely two very different social signals, with the latter carrying much greater weight.

Here I investigated how implied and real social presence are different in a consumer choice context, with the hypothesis that in both the real and implied social presence conditions participants would impression manage by looking more at, and choosing, items that were brand names, compared to their generic options. Furthermore, in terms of provocative vs. neutral pairings of products, participants would avoid looking at, and choosing, products that were more provocative in favour of the neutral choice. Results reveal that attention and choice during the purchasing task are influenced by social presence, but in different ways, with effects varying depending on the type of items participants are viewing.

For brand vs. generic items there was ultimately no effect of changing social presence conditions on visual attention. There was, however, an effect of social presence on choice behaviour, with the brand item being selected more than the generic version, especially when there is a real source of presence.

For the provocative vs. neutral items, participants exhibited no preferential bias towards looking at provocative items in the real presence condition, whereas when there was no social presence, there was a very different and strong tendency to look at the provocative items. Most remarkably, and dovetailing with the Study 2 calendar study, was my finding that the effect of implied social presence initially looks like that the real presence condition, with participants showing no bias towards the provocative items; but as the study moved beyond 10 minutes, participants show a distinct bias towards looking at the provocative images, just as if there was no social presence. And, again, I found that choice behaviour was not predicted by looking behaviour, with neutral items (and not provocative items) chosen most across all conditions, and especially so in the real condition in the last  $\frac{3}{4}$  portion of the study. This contradiction of visual attention allocation and subsequent purchase counters for both brand vs generic items, and

provocative vs neutral items, diverges sharply from what tends to be a truism in the consumer behaviour literature (Gidlof, et al. 2017), that is, what you look at is what you choose to purchase.

## **Chapter 6**

### **6.1 Thesis Overview**

The overall objective of this thesis was to investigate how real and implied presence are similar or different from each other, and to explore potential mechanisms -- such as self-awareness, cognitive load, and proximity -- that can account for the effects observed.

I initially reviewed research on social presence, both real and implied; and discussed recent work investigating the influence of social presence on gaze behavior and the implications of this work for understanding social attention in particular, and human behaviour in a social setting in general. In the experiments that followed, I used novel paradigms that directly tested the influence of social presence, and contrasted real and implied presence using visual attention as a common metric. Past studies had not measured implied presence effects directly, especially not in systematic ways, and little was known on how implied and real presence compare in terms of influencing social behaviours. It was also unclear whether, and if so how, implied presence measured up to previously documented real social presence effects. My final experiment examined how attention and choice compare in a unique purchasing paradigm. Collectively, the studies here address this matter in systematic experiments within a laboratory setting.

Below I discuss the key take-aways in each of the chapters.

### **6.2 Summary of Thesis**

#### **6.2.1 Chapter 1**

There is an astounding amount of research documenting how the presence of a real person

influences the behaviour of others (Zajonc, 1965; Satow, 1975; Buck, Losow, Murphy & Costanzo, 1992; Guerin, 1986; Levine, Resnick & Higgins, 1993; Herman, Roth & Polivy, 2003; Leimgruber, Shaw, Santos & Olson, 2012). However, little is known about how implied social presence compares to these well documented effects of real social presence. There are some similarities in the effects of actual and implied social presence, with both improving behavior in simple tasks (Pessin & Husband, 1933; Putz, 1975), and both appearing to increase conformance to social norms (Baumeister, 1982; Rompay, Vonk & Fransen, 2008). Yet, there are also hints that actual and implied social presence effects might have a weaker or more transient effect on performance than a real physical presence (Powell et al., 2012). In other words, while real and implied social presence might be *qualitatively* similar, there might be *quantitative* differences, although there are a limited number of direct comparisons from which to draw.

Argo et al., (2005) state that the developing an experimental design that is amenable to manipulations of real and implied social presence would represent a significant theoretical and empirical advance to the field, as it would enable direct tests to be made between the two forms of presence if a common metric could be used. I proposed that eye movements might be an ideal objective measure to capture behavioral differences with changes in social presence. We use our eyes to collect information and communicate with others – and based on my review of the social presence effects, the real or implied presence of others seems to impact one's looking behavior (Gallup et al. 2012; Laidlaw et al., 2011; Risko & Kingstone, 2011). And to examine if real and implied social presence differ quantitatively and/or qualitatively, I would manipulate variables that have been suggested to modulate the effects of real or implied social presence (e.g., physical proximity and the number of sources of social presence).

In sum, while there is a sense that real and implied social presence are similar, but not identical, determining precisely *how* they are the same and different, and if any overlaps and divisions exist, has been limited by the failure to establish a common metric and paradigm for measuring the effects of presence across real and implied situations. The thesis sought to make an initial step towards addressing this gap in the field's knowledge.

### **6.2.2 Chapter 2**

Risko and Kingstone (2011) discovered that looking behaviour is affected by wearing an eye tracker. When provided with the opportunity to look at a sexy swimsuit calendar mounted on a wall, the vast majority of participants chose not to do so if their eyes were being monitored by the eye tracker. However, if participants believed that the eye tracker was turned off, or if they were not wearing an eye tracker at all, then they looked at the swimsuit calendar. In short, participants change their looking behaviour when they know or believe that their eye movements are being recorded by an eye tracker; and this change is consistent with impression management. The eye tracker functions as an implied social presence that leads individuals to adjust their looking behaviour in a prosocial manner.

In Study 1, I adapted the Risko and Kingstone paradigm to explore how social presence influences behaviour over time, and if it is a transient or sustained effect. The study revealed that on the very first wearing of an eye tracker, and in less than 10 min, the implied presence effect of an eye tracker is abolished (i.e., participants tend to look at the swimsuit calendar rather than avoiding that behaviour). But by drawing attention back to the eye tracker, the implied presence effect is readily re-established (i.e., participants avoid looking at the swimsuit calendar). This suggests that eye trackers induce a transient social presence effect, which is rendered dormant when attention is shifted away from the source of implied presence.

One might ask, however, if an eye tracker merely makes a person self aware (i.e., attention is committed internally) just like a mirror makes one self aware (Carver & Scheier, 1978). In other words, the eye tracker may *not* be inducing a social presence effect insofar as it makes a person feel "watched". Rather an eye tracker simply triggers attention to be directed towards one's self. To distinguish between these alternatives, in Study 2, I ran the Risko and Kingstone (2011) paradigm, but used a mirror in lieu of an eye tracker. If the effect is only that of a self-awareness effect (i.e., watching oneself), and not a social presence effect (feeling watched by another), then participants should avoid looking at the calendar when they are faced with a mirror. The findings did not support this idea. Participants did not selectively reduce looks to the provocative calendar when faced with a mirror, thereby excluding the solely self-aware interpretation. Rather, it appears that the implied presence of another is critical to participants avoiding looking at the calendar. As an interesting aside, I did discover that people who tend towards narcissism are more inclined to look at themselves in the mirror (and in turn look less at the provocative calendar in the room).

There were some key limitations inherent to the paradigm used in my first two studies. Although I could capture attention by measuring looks towards a provocative stimulus, I could only measure a single look that was characterized by both a head turn and a fixation on the calendar. In an ideal world, I would be able to measure looks towards (or away) from a provocative stimulus on multiple trials, and possibly without any head turn at all. I also needed a way to directly measure real and implied social presence. The studies in Chapter 3 sought to overcome these limitations.

### **6.2.3 Chapter 3**

In this chapter, I implemented a novel paradigm to assess and directly compare eye movements -- without any head movement -- to neutral vs. provocative stimuli over multiple trials;

and I also included a real social presence condition in addition to the implied social presence condition. Thus Chapter 3 examined whether an eye tracker can operate as an implied social presence in a manner that affects eye movement alone, over repeated trials, in order to acquire a more nuanced measurement of the effects of real vs. implied social presence on visual attention.

Study 3 was my initial attempt to create such a paradigm. I investigated how participants looked at the images of models in advertisements, both neutral and sexually provocative, and how that varies in cases of real and implied social presence, with a baseline -- no social presence -- condition also included. The findings suggested that participants in both the real and implied social presence exhibit changes in looking behaviour when compared to the control (no social presence) condition. Participants in the real and implied social presence conditions looked more at the faces of the images than other region of the body, whereas in the control condition participants looked more at the chest than the face. One can conclude from these findings that the oculomotor system -- even without a head movement -- is susceptible to the influences of real and implied social presence, with an eye tracker serving as the implied social presence. These social presence effects drive participants to fixate on the more socially acceptable areas of an image (the face) when they were being monitored vs. those in a condition with no social presence (who look at the chest more than the face). These effects were not modulated by changes in the provocativeness of the images, but it is possible that this is because other items in the advertisements, such as text in images, might have distracted participants to attend to other things than changes in provocativeness.

In Study 4, I created more controlled images and refined the paradigm used in Study 3, creating a two-alternative forced-choice display (2AFC) (e.g., Fechner, 1966), that pitted one stimulus (a provocative image) against another (a neutral image). This allowed me to directly

assess looking behaviour for provocative vs. neutral images within the same trial. The hypothesis was that if people know that their eye movements are being recorded (implied presence condition), or feel like they are being monitored by a person in the room (real presence), they will avoid looking at the provocative images and fixate more on the neutral images (more socially appropriate item to look at). Consistent with this prediction, participants in both the implied and real social presence conditions showed a significant preference to look at the neutral images rather than the provocative image. In contrast, those in the baseline condition who were unaware that their eye movements were being recorded looked more at the provocative images. These findings indicate that implied presence and real presence exert similar effects on eye fixations. The data in this chapter represent one of the first, and certainly the most refined, series of studies to directly measure the effects of real, implied, and no social presence in conditions that make them directly comparable.

#### **6.2.4 Chapter 4**

In this chapter I manipulated variables that have been implicated in the past as factors that modulate real or implied social presence, in order to get a sense of whether the effects are always quantitatively and/or qualitatively similar. In Study 5, I introduced a cognitive load manipulation to the 2AFC paradigm used in Study 4, to investigate if monitoring one's looking behaviour in real and implied presence conditions is cognitively demanding, and to explore if it has the same effect for real and implied social presence. It was expected that as load increased, the effect of social presence would decline. The data replicated the 2AFC findings from before, with a preference to look at the provocative stimuli occurring only in the no presence condition. I also found, for the first time, a quantitative difference between real and implied social presence, with participants in the real presence condition looking more at the neutral images than the implied presence condition.

While there was also an effect of load, where participants induced with high cognitive load were more likely to look at faces of the stimuli than in instances of low load, load did not interact with social presence, suggesting the prosocial looking behaviour induced by social presence is not a cognitively demanding process.

In Study 6 I investigated the potential mediating factor of proximity as outlined in Latane's Social Impact Theory (1981), where it is thought that proximity is critical to social presence influencing behaviour. Proximity has previously been shown to influence purchasing behavior in a real presence context (Argo, et al., 2005). The results of my study indicate that proximity does have an effect in the context of a real social presence. When participants have a real source of presence in close proximity to them compared to further away, they make significantly more fixations to neutral images. Importantly, an effect of implied social presence was not observed for a camera placed close or far from the observer. Note that this is the first study that used a camera mounted on a tripod, rather than a camera positioned close to the eye (i.e., an eye tracker). This suggests that for a camera to have an implied social presence effect on looking behaviour, its proximity needs to be extremely close to the eye. Nevertheless, for the first time, the present study found not just a quantitative difference between real and implied presence, but a qualitative one as well.

### **6.2.5 Chapter 5**

Having examined how implied and real social presence compare across a variety of social factors (e.g., self-awareness or proximity), I turned to investigating how social presence affects choice; and how looking behaviour and choice are related. To answer these questions, I returned to using an eye tracker, and modified my 2AFC paradigm into a unique purchasing paradigm, with participants having to select to purchase provocative vs neutral items, or brand vs generic items.

The results revealed that looking behaviour and product choice are influenced by social presence, but in very different ways, with the effects varying depending on the type of items participants are viewing. For brand vs. generic items, people tend to look at the two types of products the same way (50/50). On the other hand, for provocative vs. neutral items, participants in the real presence conditions show no tendency to look at the provocative items more than the neutral items. However, in the no presence condition, participants tend to look at the provocative items. These findings are consistent what I have found before. What is especially interesting is that because this study was fairly long, I could separate out looking behaviour for the first  $\frac{1}{4}$  trials (approximately the first 10 minutes of the experiment) and compare it to the final  $\frac{3}{4}$ . Recall that in Study 1, I found that the effect of implied social presence tended to disappear after 10 minutes. This is precisely what I found here. Initially, participants in the implied social presence condition behaved like the real presence condition. However, by the end of the study, participants in the implied social presence condition were behaving like the no presence condition; that is, they were fixating much more on the provocative items than the natural items.

For purchasing behaviours, a very different pattern of results was obtained. Here, changes in social presence affected both the selections for brand vs. generic items, and provocative vs. neutral items, in similar ways. Specifically, the selection behaviours are consistent with impression management. Participants chose the brand items in all conditions, but especially in the real presence condition. This replicates what was previously shown in the field study by Argo et al. (2005), where participants chose the more expensive brand name product when there was a real physical presence (more so than a generic option for that item), which supports the ecological validity of this controlled lab design. Similarly, participants chose the neutral (rather than the provocative) item in all conditions, but especially so in the real presence condition.

Finally, it is important to note that the looking behaviour was a poor predictor of the choice behaviour, something that contradicts accepted knowledge in current consumer behaviour literature. Variation in social presence had no effect on looking behaviour for brand vs generic items, but it did have an effect on choice behaviour, with brand items being selected most in the real presence condition. Similarly, variation in social presence affected whether people looked at the provocative items or not, but for choice behaviour people chose the neutral items the most in all presence conditions, even in the no presence condition where participants had looked at the provocative items more than the neutral items.

In sum, (1) implied social presence is uniquely affected by the passage of time, in a manner that no presence and real presence are not; (2) the effect of social presence on looking behaviour vis-a-vis impression management, vary for different types of items (e.g., provocative vs. brands); (3) that the effect of social presence on impression management for the actual selection of items is evident for both provocative items and brands; and (4) looking behaviour is a poor predictor of choice behaviour.

### **6.2.6 Summary**

The evidence from this group of studies helps to shed light on how real and implied social presence influences behavior, and how in some cases they influence behavior similarly (Chapter 3), in others their effects differ quantitatively (Chapter 4, Study 5), and yet in others their effects can differ both quantitatively and qualitatively (Chapters 4 and 5, Studies 6 & 7). The data from Chapter 2 established that implied presence effect is more transient in nature for head and eye movements, and that this effect reflects social presence and not solely self-awareness. Chapter 3 established that the knowledge of being eye tracked influences prosocial looking behaviour without a head movement, in a manner that is similar to real social presence. Chapter 4 revealed

that the effects of implied and real presence may differ quantitatively (cognitive load), and qualitatively (proximity). Chapter 5 sheds light on real world influences of social presence, with both implied and real presence influencing choice of a purchase in similar ways, but that attention allocation is a poor predictor of those choices.

### **6.3 Implications**

This research is the first to compare real and implied presence using looking behaviour as a common metric. It shows that real and implied social presence affect looking behaviour both when it is combined with a head movement, and when it is isolated to eye movements alone. It also demonstrates that there is real world validity of this work to past studies on purchasing decisions. These findings highlight the important relationship between types of social presence, visual attention, and subsequent decisions. I systematically show that real and implied presences while often similar in nature, can differ both quantitatively and qualitatively. Additionally, I make a new contribution to the consumer behavior literature, showing that what people choose is not always predicted by what they attend to, and that social presence plays a role in this relationship. I have also addressed a number of limitations identified by research conducted by Dahl et al., (2001) as I was able to manipulate the types of social presence here in order for there to be consistent testing of the presence effects, using an objective measure of visual attention, in a controlled lab environment.

I also demonstrate what was previously found by the Nasiopoulos et al. (2014) – [Chapter 2] that implied social presence is directly influenced by the length of time an individual is exposed to the presence. This seems a critical demonstration from both a theoretical and a practical point of view. For example, it suggests that any prosocial behavior (e.g., surveillance cameras in retail

stores and public spaces) might be short-lived. Indeed, this interaction between exposure and presence suggests that it might be harder to “forget” there is another person present than forget about the surveillance equipment monitoring you. Methodologically, these findings have a number of important implications for attention researchers. For example, it is clear that eye trackers alter looking behavior that could be problematic in a number of scenarios. Importantly, this effect may be minimized through familiarity or exposure, but this effect is fragile in the sense that a simple reminder that a person is wearing an eye tracker can switch individuals back to impression managing their gaze (Nasiopoulos et al., 2014).

Another interesting methodological implication of these findings is that it may be possible to study social attention in a more socially authentic manner, without involving anyone but the participant in the study, since the presence of another person simply needs to be implied. Obviously, there are some practical attractions to such a situation. For instance, it would mean that research could gain some experimental control without compromising the social authenticity of the situation.

#### **6.4 Theoretical contributions**

Evidence from Chapter 2 indicates important findings that support the view that implied presence is of a transient nature. Convergent with these findings that the effect is transient is a meta-analysis by Sparks and Barclay (2013), who report that exposure to eye-like images will increase cooperative behaviour (e.g., Ernest-Jones et al., 2011), but only when exposure is for a short period of time (e.g., less than several minutes). The data here would suggest that the mechanisms underlying implied social presence effects are vulnerable to time, and the power of the eye tracker to induce a social presence effect is can be quickly drained unless attention is drawn back to the source of implied presence (supported by the recalibration condition data in Chapter

2).

Furthermore, given the findings that there are instances where real and implied presence indicate qualitative and quantitative differences, it may be that there is a difference in how key mechanisms for social presence effects are being engaged or sustained. For instance, to the extent that implied presence is internally activated (e.g., having to do with the imagined presence of another) and real presence is externally driven (i.e., there is actually another person in the room that can serve as a constant reminder of a potential interaction); it follows that the former may be more susceptible to the passage of time, hence its transient nature. One could draw similarities to prospective memory and vigilance comparisons, where internal reminders in prospective memory allow for similar transitory properties as implied presence compared to the more sustained properties of vigilance (Graf & Uttl, 2001; Oken et al., 2006).

This work further contributes to social presence literature by investigating how important factors such as proximity of presence influence behaviour in a social presence context. This factor has been discussed in the social action theories as a potentially integral factor of social behaviour, yet little work has investigated how manipulating this variable might change the expected behaviour of individuals until now.

## **6.5 Possible Limitations**

Although people are inclined to attend to certain aspects of their environment overtly, it is always possible that they could also attend to items covertly (i.e., "out of the corner of their eye") and these attentional allocations would be missed. Thus, the findings that use overt attention as a measure of presence effects will represent a reasonable and conservative estimate of the effect of social presence. Another limitation is that looking behavior is arguably different from other norm

conformance behaviours observed in social presence effects such as helping behaviours, generosity and general conformance to norms.

Who is imagined or implied when a camera or other monitoring stimuli are present might also be a limitation. Who is doing the evaluation is suggested as being a key factor on the impact of the strength of the social presence effect and is a limitation of its own to consider in cases where a real presence will be used. For instance, being evaluated by a stranger seems to make self-presentation worries strongest (Buck et al., 1992). In experiments where the source of implied presence allows for participants to imagine who might be evaluating them, this could be a valid concern as it could change the strength of the effect depending on who they envision being on the other end. In discussing the factors which may characterize the strength of the social presence, Latane (1981) outlines distinctly human characteristics which cannot be associated with such sources as a camera, including the age and the status of the source. The individual's prior relationship with the source has also been proposed to influence the strength of the social presence (Latane, 1981) and has been shown to affect the extent to which people inhibit emotions in the presence of another (Buck, Losow, Murphy & Costanzo, 1992). Implied social presence leaves unclear many characteristics about the source that are readily apparent to participants with the use of real social presence. Future research would benefit from the categorization of the strength of different forms of implied social presence.

Another possible limitation of the use of video cameras as a form of implied social presence, is that the number of sources implied in the use of a single camera is unknown. Whereas real social presence allows one to assess the exact number of watchful eyes present, the use of a video camera leaves unclear how many people might be watching. One interesting direction would

be to examine whether the number of people participants believe will be watching their recording affects the extent to which they engage in impression-management.

Finally, it should be noted throughout my studies, gender was left out of the analyses, given that the number of male participants was largely disproportionate to the female ones. Thus it is important to note that when the data from the comparable studies (Studies 3, 4, 5 and 6) are pooled together - to conduct a larger analysis on gender effects - I find no interactions of gender and with the highest order interaction of AOI, provocativeness, gender and condition of presence returning a non significant interaction  $F(4,468) = .661, p = .862$ . Nevertheless, a limitation of the present study was an inability to systematically match and investigate the effects of gender for each of the individual experiments.

## **6.6 Future Research**

In accordance to Social Impact Theory (Latane, 1981), I documented an effect on how participants allocated their attention in situations of social presence based on the proximity of the presence. In order to further our understanding of the effects suggested by Social Impact Theory, future research could investigate how the number of sources of presence may influence this effect as mentioned in the previous section. Latane (1981) also mentions the number of sources of presence being an important factor, and alongside proximity could also reveal interesting comparisons across real and social presence. Manipulating the number of sources of real and implied social presence in the paradigm used in Chapter 3, and measuring how people direct their attention to provocative and neutral images in the presence of no social presence, one camera/person or three cameras/people would be an interesting addition to the work put forth here. It could be that the more sources of presence, the more influence there would be on the individual, until ceiling is reached and adding additional sources of presence have no additional effect. What

is unknown is how implied presence will compare to real sources of presence in this instance, as well as how that will translate to looking behaviour and therefore eye movements. It is expected here that an increase in the number of implied sources of presence would increase the influence of social presence and heighten the previous effects found – where individuals attend to images in a more socially appropriate manner. In this case I expect the increase in the sources of implied presence to induce similar effects, with a heightened response from an increase in self-awareness and higher activation of impression management behaviours.

How the factor of size varies between real and implied presence remains to be teased apart, as well as how a real source of presence might interact with an implied presence source when both are introduced into an environment (e.g., must a real source of presence always reduce the impact of an implied presence?). This is also a future study of interest, again by using the same paradigm as Chapter 3, and introducing a manipulation where a real person and a camera are present. This will allow for the teasing apart of the effects of a real presence over the implied presence.

Future research could build on further understanding boundary conditions for implied social presence. In these studies, the nature of the “surveyor” was of that of an experimenter (at least in the real presence condition). As previously mentioned, there have been findings suggesting “who” the social presence is might influence behavior in different ways by establishing different social norms one should adhere to. Luo (2005) found this to be the case in the context of impulsive purchasing. It was reported that the presence of family members decreased impulsive purchases, whereas the presence of peers increased impulse buys. Luo (2005) explained this finding by arguing that peers are more likely to reward spontaneity and so impulsivity becomes more socially desirable, whereas family members might be more likely to have economic concerns such as wasting money or be more likely to bring out feelings of responsibility to others, making impulsive

behavior undesirable. This highlights the importance of the normative expectations of the “presence” and how this drives the influence of social presence. How this might influence these effects of attention and choice is unknown, but could be tested by manipulating the nature of the confederate for real social presence conditions as well as priming individuals to imagine a variety of different attributes to the implied presence (i.e., influencing “who” is implied to be watching them).

## **6.7 Conclusion**

This body of work has summarised some compelling evidence that implied presence, as well as the physical presence of others, influences the decisions and behaviour of individuals. In some instances, both implied presence and real social presence influence behaviour in a similar manner, whereas in other cases, they differ quantitatively or qualitatively. Given the gaps of knowledge that existed in the literature, I investigated the current understandings of the field in social presence research, and reconciled implied and real presence effects by conducting studies with novel paradigms to contrast and compare the influence of social presence on behaviour, the attentional mechanisms involved, downstream effects on choices and decisions, and boundary conditions for the effects. With these investigations, I have evolved our understanding of both real and implied social presence effects, and contributed both methodologically and theoretically to the field of social presence, consumer behaviour and social attention research.

## References

- Alba, J. W., & Hutchinson, J. W. (1987). Dimensions of consumer expertise. *Journal of consumer research, 13*, 411-454.
- Argo, J. J., Dahl, D. W., & Manchanda, R. V. (2005). The influence of a mere social presence in a retail context. *Journal of Consumer Research, 32*, 207-212.
- Argyle, M., & Cook, M. (1976). *Gaze and Mutual Gaze*. Cambridge, UK: Cambridge University Press.
- Ashworth, L., Darke, P. R., & Schaller, M. (2005). No one wants to look cheap: Trade-offs between social disincentives and the economic and psychological incentives to redeem coupons. *Journal of Consumer Psychology, 15*, 295-306.
- Baron-Cohen, S. (1995). *Mindblindness: An Essay on Autism and Theory of Mind*. Cambridge, MA: MIT Press.
- Bateson, M., Nettle, D., & Roberts, G. (2006). Cues of being watched enhance cooperation in a real-world setting. *Biology letters, 2*, 412-414.
- Baumeister, R. F. (1982). A self-presentational view of social phenomena. *Psychological bulletin, 91*, 3-26.
- Bergum, B. O., Lehr, D. J. (1963). Effects of authoritarianism on vigilance performance. *Journal of Applied Psychology, 47*, 75-77.
- Birmingham, E., Bischof, W. F., & Kingstone, A. (2008a). Social attention and real world scenes: The roles of action, competition, and social content. *Quarterly Journal of Experimental Psychology, 61*, 986-998.
- Birmingham, E., Bischof, W. F., & Kingstone, A. (2008b). Gaze selection in complex social

- scenes. *Visual Cognition*, 16, 341–355.
- Birmingham, E., & Kingstone, A. (2009). Human social attention: A new look at past, present and future investigations. *Annals of the New York Academy of Sciences*, 1156, 118-140.
- Bond, C. F. (1982). Social facilitation: A self-presentational view. *Journal of Personality and Social Psychology*, 42(6), 1042.
- Bond, C. F., & Titus, L. J. (1983). Social facilitation: a meta-analysis of 241 studies. *Psychological bulletin*, 94, 265.
- Carver, C. S., & Scheier, M. F. (1981). *Attention and self-regulation*. New York: Springer-Verlag.
- Chapman, A. J. (1973). Social facilitation of laughter in children. *Journal of Experimental Social Psychology*, 9, 528-541.
- Chawarska, K., Klin A., & Volkmar, F. (2003). Automatic attention cueing through eye movement in 2-year old children with autism. *Child Development*, 74, 1108– 1122.
- Cheng, J.T., Tracey, J.L., Foulsham, T., Kingstone, A., & Henrich, J. (2013). Two ways to the top: Evidence that dominance and prestige are distinct yet viable avenues to social rank and influence. *Journal of Personality and Social Psychology*, 104, 103-125.
- Coutrot, A., & Guyader, N. (2014). How saliency, faces, and sound influence gaze in dynamic social scenes. *Journal of Vision*, 14, 5, 1-17.
- Dashiell, J. F. (1930). An experimental analysis of some group effects. *The Journal of Abnormal and Social Psychology*, 25(2), 190-199.
- Dahl, D. W., Manchanda, R. V., & Argo, J. J. (2001). Embarrassment in consumer purchase: The roles of social presence and purchase familiarity. *Journal of Consumer Research*, 28, 473-481.
- Ekström, M. (2012). Do watching eyes affect charitable giving? Evidence from a field

- experiment. *Experimental Economics*, 15, 530-546.
- Ernest-Jones, M., Nettle, D., & Bateson, M. (2011). Effects of eye images on everyday cooperative behavior: a field experiment. *Evolution and Human Behavior*, 32(3), 172-178.
- Findlay, M. M. & Gilchrist, I. D. (2003). *Active Vision: The Psychology of Looking and Seeing*. Oxford University Press.
- Foulsham, T., Cheng, J.T., Tracy, J.L., Henrich, J. & Kingstone, A. (2010). Gaze allocation in a dynamic situation: Effects of social status and speaking. *Cognition*, 117, 319-331.
- Foulsham, T. & Sanderson, L. A. (2013). Look who's talking? Sound changes gaze behaviour in a dynamic social scene. *Visual Cognition*, 21, 922-944.
- Francey, D., & Bergmüller, R. (2012). Images of eyes enhance investments in a real-life public good. *PloS one*, 7(5), e37397.
- Freeth, M., Foulsham, T. & Kingstone, A. (2013). What affects social attention? Social presence, eye contact and autistic traits. *PLoS ONE*. 8(1): e53286. doi:10.1371/journal.pone.0053286
- Friesen, C. K. & Kingstone, A. (1998). The eyes have it!: Reflexive orienting is triggered by nonpredictive gaze. *Psychonomic Bulletin & Review*, 5, 490-495.
- Frischen, A., Bayliss, A. P., & Tipper, S. P. (2007). Gaze cueing of attention: visual attention, social cognition, and individual differences. *Psychological Bulletin*, 133, 694– 724.
- Gallup, A. C., Hale, J. J., Sumpter, D. J T., Garnier, S., Kacelnik, A., Krebs, J. R., & Couzin, I. D. (2012a). Visual attention and the acquisition of information in human crowds. *Proceedings of the National Academy of Sciences of the United States of America*, 109, 7245-7250.
- Graf, P., & Uttl, B. (2001). Prospective memory: A new focus for research. *Consciousness and cognition*, 10(4), 437-450.
- Geen, R. G. (1985). Evaluation apprehension and response withholding in solution of

- anagrams. *Personality and Individual Differences*, 6, 293-298.
- Gidlöf, K., Anikin, A., Lingonblad, M., & Wallin, A. (2017). Looking is buying. How visual attention and choice are affected by consumer preferences and properties of the supermarket shelf. *Appetite*, 116, 29-38.
- Guerin, B. (1986). Mere presence effects in humans: A review. *Journal of Experimental Social Psychology*, 22, 38-77.
- Herman, C. P., Roth, D. A., & Polivy, J. (2003). Effects of the presence of others on food intake: a normative interpretation. *Psychological bulletin*, 129, 873-886.
- Itti, L., and Koch, C. (2000). A saliency-based search mechanism for overt and covert shifts of visual attention. *Vision Research*, 40, 1489-1506.
- Kingstone, A., Smilek, D., Ristic, J., Friesen, C.K., & Eastwood, J.D. (2003). Attention, researchers! It is time to take a look at the real world. *Current Directions in Psychological Science*, 12, 176-180
- Kingstone, A., Smilek, D., & Eastwood, J.D. (2008). Cognitive Ethology: A new approach for studying human cognition. *British Journal of Psychology*, 99, 317-345.
- Laidlaw, K.E.W., Foulsham, T., Kuhn, G., & Kingstone, A. (2011). Potential social interactions are important to social attention. *Proceedings of the National Academy of Sciences*, 108, 5548-5553.
- Laidlaw, K.E.W., Risko, E.F., & Kingstone, A. (2012). A new look at social attention: Orienting to the eyes is not (entirely) under volitional control. *Journal of Experimental Psychology: Human Perception & Performance*, 38, 1132-1143.  
DOI: 10.1037/a0027075
- Latane, B. (1981). The psychology of social impact. *American psychologist*, 36(4), 343-356.

- Leimgruber, K. L., Shaw, A., Santos, L. R., & Olson, K. R. (2012). Young children are more generous when others are aware of their actions. *PloS one*, 7(10), e48292.
- Levy, J., Foulsham, T. & Kingstone, A. (2012). Monsters are people too. *Biology Letter*, 9: 20120850.
- Luo, X. (2005). How does shopping with others influence impulsive purchasing?. *Journal of Consumer Psychology*, 15, 288-294.
- Nasiopoulos, E., Risko, E. F., Foulsham, T., & Kingstone, A. (2014). Wearable computing: Will it make people prosocial? *British Journal of Psychology*. DOI:10.1111/bjop.12080
- Nettle, D., Harper, Z., Kidson, A., Stone, R., Penton-Voak, I. S., & Bateson, M. (2013). The watching eyes effect in the Dictator Game: It's not how much you give, it's being seen to give something. *Evolution and Human Behavior*, 34, 35-40.
- Okada, T., Sato, W., Murai, T., et al. (2003). Eye gaze triggers visuospatial attentional shift in individuals with autism. *Psychologia*, 46, 246–254.
- Oken, B. S., Salinsky, M. C., & Elsas, S. M. (2006). Vigilance, alertness, or sustained attention: physiological basis and measurement. *Clinical neurophysiology*, 117(9), 1885-1901
- Olk, B., Cameron, B. & Kingstone, A. (2008). Enhanced orienting effects: Evidence for an interaction principle. *Visual Cognition*, 16, 979-1000.
- Pessin, J., & Husband, R. W. (1933). Effects of social stimulation on human maze learning. *The Journal of Abnormal and Social Psychology*, 28, 148-154.
- Posner, M. I. (1980). Attention and the detection of signals. *Journal of Experimental Psychology: General*, 109, 160-174.
- Powell, K.L., Roberts, G., & Nettle, D. (2012). Eye images increase charitable donations:

- Evidence from an opportunistic field experiment in a supermarket.  
*Ethology*, 118(11),1096-1101.
- Putz, V. R. (1975). The effects of different modes of supervision on vigilance behaviour. *British Journal of Psychology*, 66, 157-160.
- Ratner, R. K., & Kahn, B. E. (2002). The impact of private versus public consumption on variety-seeking behavior. *Journal of Consumer Research*, 29, 246-257.
- Risko, E.F., & Kingstone, A. (2011). Eyes wide shut: Implied social presence, eye tracking and attention. *Attention, Perception, and Psychophysics*, 73, 291-296
- Ristic, J. & Kingstone, A. (2006). Attention to arrows: Pointing to a new direction. *Quarterly Journal of Experimental Psychology*, 59, 1921-1930.
- Ristic, J. & Kingstone, A. (2012). A new form of human spatial attention: Automated symbolic orienting. *Visual Cognition*, 20, 244-264.
- Rupp, H. A. , & Wallen, K. ( 2007 ). Sex differences in viewing sexual stimuli: An eye-tracking study in men and women. *Hormones and Behavior*, 51 , 524 – 533 .
- Rutherford, M. D., & Krysko, K. M. (2008). Eye direction, not movement direction, predicts attention shifts in those with autism spectrum disorders. *Journal of Autism Development and Disorders*, 38, 1958–1965.
- Satow, K. L. (1975). Social approval and helping. *Journal of Experimental Social Psychology*, 11, 501-509.
- Schlenker, B. R., & Leary, M. R. (1982). Social anxiety and self-presentation: A conceptualization model. *Psychological bulletin*, 92, 641.

- Senju, A., Tojo, Y., Dairoku, H., et al. (2004). Reflexive orienting in response to eye gaze and an arrow in children with and without autism. *Journal of Child Psychology and Psychiatry*, 45, 445–458.
- Smith, V. L., & Clark, H. H. (1993). On the course of answering questions. *Journal of Memory and Language*, 32, 25–38.
- Steinmetz, J., & Pfattheicher, S. (2017). Beyond social facilitation: A review of the far-reaching effects of social attention. *Social Cognition*, 35(5), 585-599.
- Strahan, E. J., Wilson, A. E., Cressman, K. E., & Buote, V. M. (2006). Comparing to perfection: How cultural norms for appearance affect social comparisons and self-image. *Body image*, 3(3), 211-227.
- Travis, L. E. (1925). The effect of a small audience upon eye-hand coordination. *The Journal of Abnormal and Social Psychology*, 20, 142-146.
- Uziel, L. (2007). Individual differences in the social facilitation effect: A review and meta-analysis. *Journal of Research in Personality*, 41, 579-601.
- Van Rompay, T. J., Vonk, D. J., & Fransen, M. L. (2009). The eye of the camera effects of security cameras on prosocial behavior. *Environment and Behavior*, 41, 60-74.
- Walker, E., Risko, E.F. & Kingstone, A. (2014). Fillers as signals. evidence from a question-answering paradigm. *Discourse Processes*, 51, 264-286.
- Weiss, R. F., Miller, F. G., Langan, C. J., & Cecil, J. S. (1971). Social facilitation of attitude change. *Psychonomic Science*, 22, 113-114.
- Wicklund, R. A., & Duval, S. (1971). Opinion change and performance facilitation as a result of objective self-awareness. *Journal of Experimental Social Psychology*, 7, 319-342.

- White, K., & Peloza, J. (2009). Self-benefit versus other-benefit marketing appeals: Their effectiveness in generating charitable support. *Journal of Marketing*, 73, 109-124.
- Wu, D.W.-L., Bischof, W.F. & Kingstone, A. (2013). Looking while eating: The importance of social context to social attention. *Scientific Reports*, 3, 2356; DOI:10.1038/srep02356.
- Wu, D.W.-L., Bischof, W.F. & Kingstone, A. (2014). Natural gaze signaling in a social context. *Evolution & Human Behavior*, 35, 211-218.
- Zajonc, R.B. (1965) Social facilitation. *Science* 149, 269–274.

## APPENDICES

### Appendix A: Model Images



These items have been removed due to copyright restrictions. There were 20 pairs of models in total, 10 pairings of female models and 10 pairings of male models that were randomly displayed to participants. A representation of image pairings above is used to show an example of the provocative image (minimal clothing) and neutral image (fully clothed) stimuli participants would have viewed during any given trial for male and female pairings.

## **Appendix B: Product Pairings**

These items have been removed due to copyright restrictions. The material depicted here was that of the 80 stimuli seen by participants, including 40 pairings of various common super market goods, with pairings for each item consisting of brand vs. another brand (filler trial), generic vs. generic (filler trial) and generic vs. brand (target trial). The 40 stimuli for pairings of provocative vs. neutral items were also included with stimuli for each pairing consisting of neutral vs. neutral (filler trial), provocative vs. provocative (filler trial) and provocative vs. neutral (target trial).